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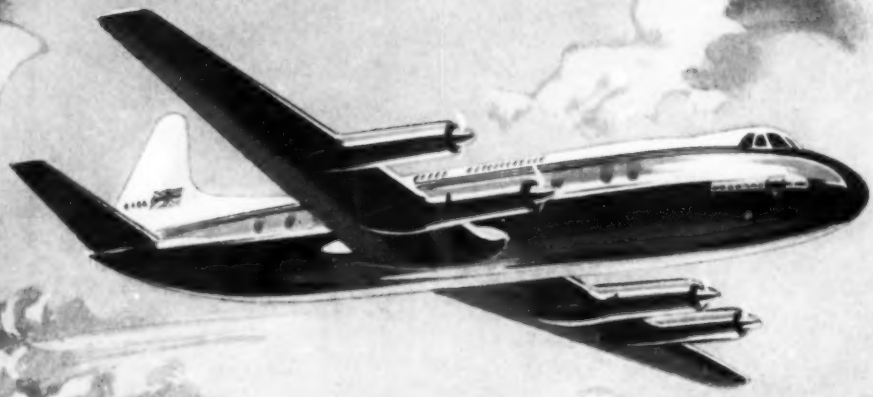

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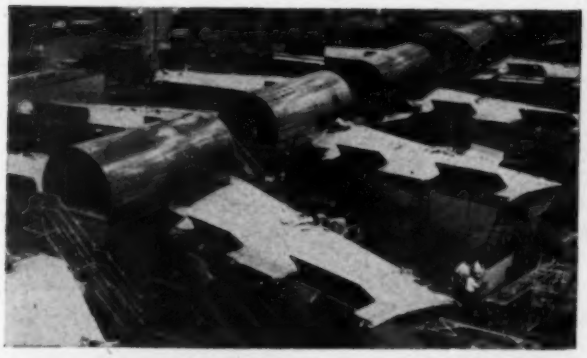

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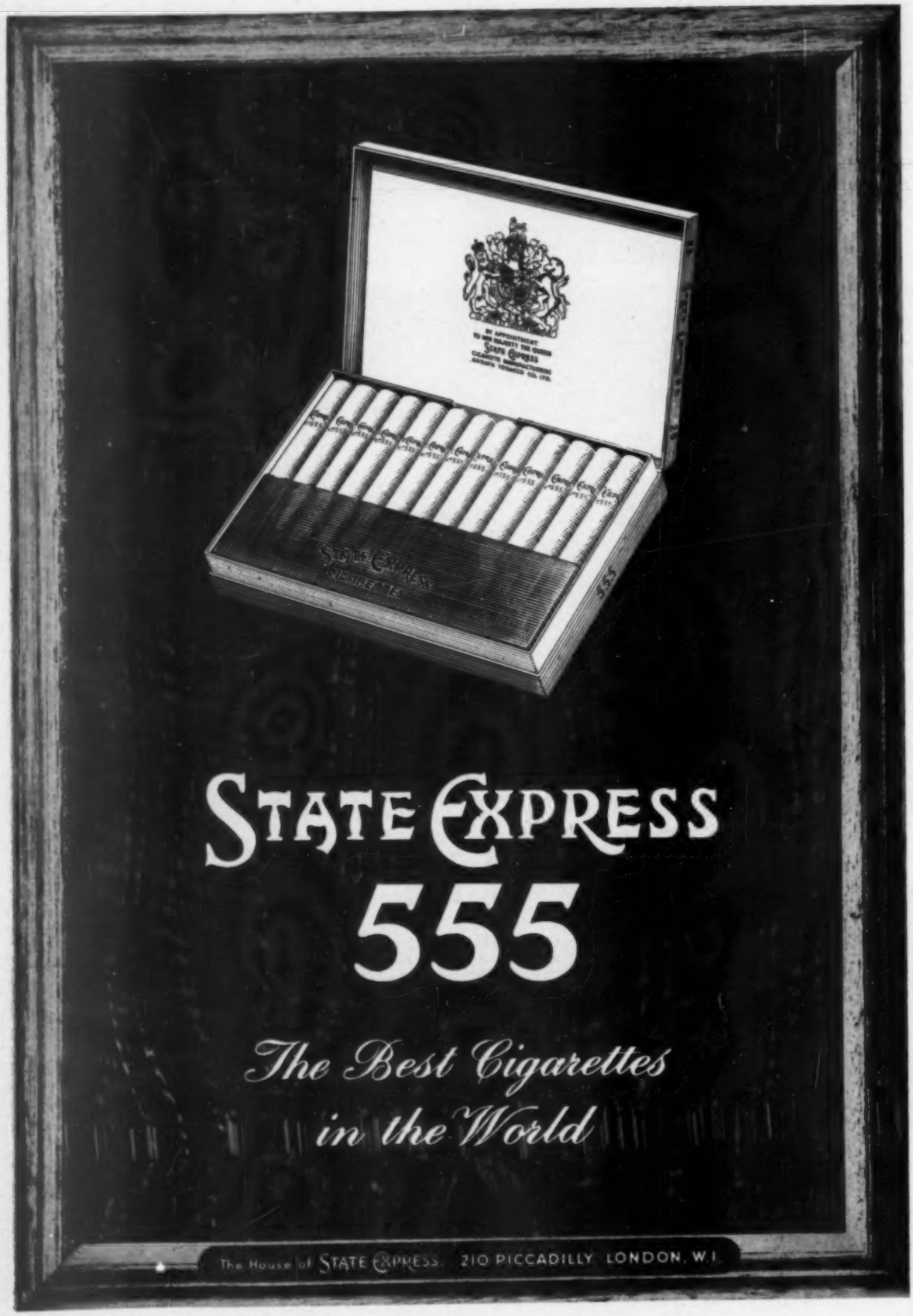
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Feats of Hercules

THE DAY IT RAINED PARATROOPS

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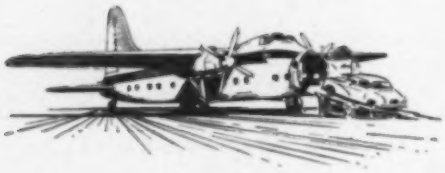

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FIRST AERONAUTICAL WEEKLY IN THE WORLD FOUNDED 1909

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and
AIRCRAFT ENGINEER

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Editor-in-Chief
MAURICE A. SMITH D.F.C.

Editor
H. F. KING M.B.E.

Technical Editor
W. T. GUNSTON

Production Editor
ROY CASEY

Iliffe and Sons Ltd.
Dorset House
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Coventry
8-10 Corporation Street
Telephone · Coventry 25210

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The Year of the Chopper

THIS editorial will concern the S.B.A.C. Display; but its title does *not* signify that Farnborough '58 is likely to suffer grievous truncation from Ministerial axings. The topic is, indeed, a pleasing one, and the tone should be, and will be, buoyant. We write (vernacularly in the heading) of Britain's new commercial and military helicopters.

At more than one Display the helicopter circus has been considered in the general view a bit of a bore. True, the Westland family-troupe acrobatics and the headlong plummeting out of the sky by the Fairey Ultra-Light have succeeded in rousing even the best-lunched guests; but so commonplace have the "choppers" become, and so familiar today are their unique abilities, that their pilots are increasingly exercised in putting them across. This year, however, will see the rotorcraft really coming into their own, and it may well go on record as the golden year of the helicopter—the year when the world-leading Rotodyne and Westminster made their public débuts, and when the challenging Saunders-Roe 531, Bristol 192 and production-type Wessex took their own places in the arena.

Though bulking less huge than Russia's mammoth Mi-6, the Rotodyne and Westminster both have a claim to leadership—the Rotodyne, incontestably, as the first VTO airliner (and a 160-knotter at that); the Westminster as a brawny aerial crane, and later as a liner in its own right. Saunders-Roe's Type 531—an especially welcome member of the new family, in view of its makers' recent tribulations—is clearly after the market which has been so largely dominated by that deservedly fashionable French creation the Sud Alouette II (now licensed to America). Bristol's 192 and Westland's Wessex are destined at the outset for Britain's Armed Services, but may well find other buyers in other fields.

—and the Drive Behind It

Every one of these helicopters except the Saunders-Roe (which has a Blackburn Turboméca Turmo) is powered by Napier, either with the Eland or the Gazelle; and this major contribution by a company whose 150th anniversary we recently helped to celebrate in our pages is one of the really significant portents for this year's Farnborough. A second is the laudable speed and resolution with which Westland are carrying through the Wessex and Westminster programmes.

That Westland's technical director, Mr. D. L. Hollis Williams, has a quiet confidence in the gas turbine—while making every allowance for the continuing merits of the piston engine—was evident from his recent paper, *The Turbine Helicopter*, delivered before the Helicopter Association. He feels that where first cost is important the piston engine will compete for some years to come, particularly in the smaller sizes. He recognizes that the turbine is more sensitive to altitude combined with high ambient temperature, and agrees that to meet such conditions an oversize turbine must be installed, probably run gated at sea level. This tends to increase first cost and the gating reacts unfavourably on consumption. "However," concludes Mr. Hollis Williams, "taking the all-round view, the many advantages of turbine power outweigh the few disadvantages."

Within months at most Napier's slender but sinewy antelopes will be joined—indeed harried—by other British-made turbines having their own strong claims for helicopter application. De Havilland have their 1,000 h.p. Gnome—the anglicized General Electric T58—which may well find its own way into one or more types of British helicopters, new in design or developed from established types (e.g., Westland Whirlwind). Armstrong Siddeley will be putting forward their own P.181 of similar power; and in this same class Napier themselves are developing a Gazelle Junior. Thus, for her own helicopters, and for competitive types abroad, Great Britain will be offering no fewer than six distinct types of gas-turbine powerplant, all well adapted for rotary-wing application. One or more may, of course, be forced out of the race for acceptance. Yet we confidently advance one answer to the question of the day—"What is Britain going to offer in the years ahead to maintain her place in world markets?" In its simplest terms it is, "Competitive helicopters with competitive engines—and plenty of both."

EXHIBIT C: A Conway was the subject of discussion between the Duke of Edinburgh and Mr. J. D. Pearson, deputy director and chief executive of Rolls-Royce, Ltd., when this picture was taken during the Duke's visit to the Brussels International Exhibition on July 11.

FROM ALL QUARTERS

Space-Flight Round-Up

ON July 13, the U.S. Defense Department released photographs and details of the re-entry experiment conducted with a Jupiter IRBM on May 18. Fired from Patrick Air Force Base, it carried a standard nose-cone and re-entry body. Special equipment manufactured by the Barnes Engineering Co. recorded the re-entry photographically, the glowing nose-cone being visible for some 24 sec. Ten seconds from the start of the film the rocket body and instrument package were clearly visible (apparently several hundred feet apart). At 13 sec the nose-cone appeared as a speck of light some hundreds of feet further ahead; at 15 sec the instrument package broke into several pieces, and it completely burnt out at 19 sec, the distance between the nose-cone and the rocket body then rapidly increasing.

On July 9 a Thor-Able (Thor IRBM bearing a Vanguard second stage) conducted an inconclusive re-entry test carrying a mouse. The second stage, with the mouse aboard, was pinpointed by radio triangulation in the target area off Ascension Island, but it sank before it could be recovered.

On July 14 the British Interplanetary Society issued three of their rare press-releases. One outlined a proposed British space flight programme, the second concerned a British manned vehicle design of 1947 and the third described a design-study for a lunar probe intended to place permanent instrumentation on the moon's surface.

IN WESTERN SKIES: New air-to-air views of Gloster's rebuilt Gladiator (Bristol Mercury) and of the first production Westland Wessex helicopter (Napier Gazelle), which flew five months ahead of schedule. The vintage biplane, photographed by Russell Adams, was being flown over Gloucester by its maker's chief test pilot, W/C. "Dickie" Martin.

Borgward Kolibri I Flies

ON Tuesday of last week the German Borgward Kolibri I helicopter, powered by a Lycoming 260 h.p. engine, made a successful first flight at Bremen. The pilot was Herr Rohlffs, a pioneer helicopter exponent and holder of several records. He took the machine to a height of 10ft and carried out various planned tests. The Kolibri was designed by Professor Focke.

R.A.F. Pilot Killed in U-2

THE U.S.A.F. announced last week that S/L. Christopher Walker, R.A.F., was killed when a Lockheed U-2 research aircraft which he was flying crashed in the Texas Panhandle on July 8. He was on attachment at Laughlin Air Force Base, Del Rio, Texas.

Walker was found in his ejection seat 300 yd from the wreckage, on which a security guard was at once placed.

A second U-2 crashed on the following day, 100 miles away. Both aircraft are believed to have disintegrated in flight.

Twenty-four hours later it was announced that all U-2s had been grounded pending investigation. At least four have now crashed.

New Hawker Siddeley Director

THE appointment of Mr. Crawford Gordon, O.B.E., president of A. V. Roe, Canada, Ltd., to the Board of the Hawker Siddeley Group, Ltd., is announced. This appointment, comments a Hawker Siddeley statement, underlines Hawker Siddeley's increasing interest in the Canadian industrial field. Mr. Crawford Gordon became president and general manager of Avro Canada in October 1951, having served for some years as Canadian Co-ordinator of Defence Production. Previously he was president of the English Electric Company of Canada, Ltd., and executive vice-president of the John Inglis Co., Ltd. During the war he was on loan to the Department of Munitions and Supply, where he was Director-General of Organization and Assistant Co-ordinator of Production. He continued with the Department of Reconstruction and Supply as Director-General of Industrial Conversion, and in 1946 was awarded the O.B.E. for his services.

When, in 1951, Mr. Gordon became president of Avro Canada, Ltd., he succeeded Sir Roy Dobson, C.B.E., F.R.Ae.S., J.P., who then became chairman of Avro Canada and who was recently appointed managing director of the parent company, the Hawker Siddeley Group, Ltd. Under the leadership of Sir Roy Dobson and Mr. Crawford Gordon, A. V. Roe, Canada, Ltd., has made substantial progress, expanding over the past thirteen years from a company employing only 300, and with negligible sales, to a combine having emp!oyment in excess of 20,000 and showing a combined sales figure of $234,811,024 and an operating profit of $23,937,035.

GREAT DAY: Commemorating the storming of the Bastille and the tenth anniversary of the Silver City car-ferry service (see pages 79-83 of this issue) Dr. J. Pouget, Mayor of Le Touquet, names one of the airline's Bristol Freighters "The Fourteenth of July." The ceremony was conducted at Lydd (Ferryfield) Airport, Kent.

Hiller's New Name

IT is announced that the company name "Hiller Helicopters" has been changed to "Hiller Aircraft Corporation." The new name is thought to be more suitable because the company's activities for the past five years have been considerably diversified to include many other aircraft fields in addition to helicopters.

Fairey Marine Appointment

IN succession to Mr. H. L. Pearce, O.B.E. (who, acting on medical advice, has retired), Mr. C. G. James, O.B.E., A.F.R.Ae.S., has been appointed as manager of Fairey Marine, Ltd., Hamble, Hants. Mr. James has been assistant manager, Hamble, for the past twelve years. He joined Fairey Aviation as a draughtsman in 1928 and was appointed chief draughtsman, Hamble, on Seafox design in 1936. He served throughout the war in the R.A.F., was twice mentioned in despatches and was appointed O.B.E. for his work as a wing commander on the Burma airlift.

THE OSTIV CONGRESS

THE seventh congress of the world technical and scientific organization of gliding, OSTIV, was held at Leszno, Poland, during last month's World Gliding Championships. Some of those who attended the meetings were members of the teams, but many travelled to Poland especially for the Congress. The delegates were accommodated in a former royal residence at Osieczna, some eight miles from the airfield.

The congress itself opened in Leszno town, at the House of Culture, with speeches by the OSTIV president, L. A. de Lange, and by the Polish Minister of Transport and the President of the Polish Aero Club. A member of the Board of OSTIV, M. Agesilas, then read the inaugural paper on *The Development of Gliding and its Importance for Aviation and Science*. He noted that "our generation has been privileged to witness the development of gliding from crude descents to soaring in the stratosphere" and reviewed the contributions made by gliding to construction of aeroplanes, pilot training and research. A film was shown of the Californian Sierra Wave Project, and the lovely French film *Spirales*, made during the previous World Championship at St. Yan in 1956, was very well received.

Organization of the congress was extremely efficient. The remaining lectures were all held in the main building on the airfield so that delegates could keep in touch with the flying and adjourn to the café if baffled by the subject-matter or the language of the paper being presented.

In the *Salle de l'OSTIV* the first paper was given by BEVERLEY SHENSTONE, Chief Engineer of B.E.A., on the present state of sailplane design. Another British contribution was from PAUL LANGSTONE of Imperial College, who described flight measurements of the profile drag of the wing of the Skylark II sailplane. The pressure readings of the pitot tube which traversed the wing wake were recorded by an electric spark method and the computed results indicated that the transition point was at about 60 per cent on the laminar-flow section used.

The sailplanes used by British teams in World Championships have rarely shown novel features, but foreign pilots have come to expect ingenuity in the instruments we use. A talk by CDR. NICHOLAS GOODHART was therefore well attended. He described first the oxygen equipment fitted to the British gliders by Walter Kidde, Normalair and British Oxygen, then went on to give details of the capacity, weight and cost of the three systems.

Artificial horizons are of great assistance to glider pilots in countries where the cloud-base is often low. Some new horizons have been developed in Britain but the cost is a substantial proportion of that of the glider so that most pilots continue to use the war-time German horizons. These are normally supplied with A.C. by a battery-driven rotary inverter. Cdr. Goodhart described the transistor inverter fitted to his Skylark III which demands only 28 Watts from 10-volt batteries, enabling the batteries to be charged in a car. The inverter is still under development but should be available at about £15. Lt-Col. Deane-Drummond had a new Sperry HL9 horizon and transistor inverter fitted to his Olympia 419. This outfit needed only 8W at 24V but the price may restrict its use to countries where gliding is subsidized.

Finally Cdr. Goodhart referred to the electric variometers used by the British team. Designed by Harry Cook, they have thermistors to measure the rate of flow of the air from the usual insulated bottle. The response was extremely rapid and the instrument was well liked and is now on the market. The Cook compass was to be seen in sailplanes from many countries, but the speaker called attention to the importance of providing the compass with freedom in pitch and in bank so that the axis could be kept vertical for accurate reading.

S. VESELY of Czechoslovakia described the careful series of wind tunnel and flight tests which had taken place during the development of the flaps for the Blanik, Demant and Spartak sailplanes. The conflicting requirements of a wing section at low and high speeds, which led to the development of flaps for aeroplanes, are also a problem on sailplanes. Tight circling at low speeds in thermals is helped by a low wing loading and cambered wing section; at high cruising speeds, however, such a section gives high drag. Flaps are costly to build and British machines have avoided them. The Czech Aero Club, which built the beautiful Demant and Spartak, was not financially embarrassed and had undertaken careful research on the subject.

A slotted Fowler-type flap is used on a wing of section NACA 63A 615. The flap is extended partially for low speed circling and fully lowered for landing. The test sailplane had a maximum gliding ratio of 28 with the flap retracted. With the flap at 10 deg this deteriorated to 23, but the smaller turning circle made possible would usually enable the pilot to fly in a stronger part of the thermal.

A paper by AERO RESEARCH, LTD., explained the properties of the urea-formaldehyde adhesives, such as Aerolite, which have completely replaced casein for sailplane construction. It also dealt with Resorcinol-based adhesives (more expensive, but better able to withstand great heat), of polyesters and epoxy resins (for glass bonding).

In our moist climate, said the paper, Casein glues have proved unsatisfactory but there have been no complaints about Aerolite. A recent sailplane glue failure in flight in South Africa has, however, focussed attention there on the strength of glues where wings are subjected to intense sun temperatures; 215 deg F has been measured on a glider wing surface! Urea-formaldehyde glues are under suspicion in these climates after tests on specimens taken from the crashed glider. Casein, on the other hand, appears to stand heat well. It may, therefore, be necessary to use the more expensive Resorcinol adhesives for protection against both heat and moisture.

* * *

More than thirty papers were contributed on aerodynamics, airworthiness, instruments, etc. It was disappointing to find British designers unrepresented at these technical sessions. Metal construction, the use of plastics for stressed parts, aerodynamic development, sandwich structures—all these are proceeding actively in other countries, and it is depressing to find that no British designers were interested enough to attend a congress to hear about such things.

Of the foreign papers mention must be made of two superb contributions from students of the Warsaw Polytechnic, R. ALEKSANDROWICZ on *Glider Stiffness Tests* and MISS WANDA SZEMPLINSKA on *Glider Resonance Tests*. Both are research students of Professor Fiszdon, who was at Farnborough during the war and is a world expert on vibration. These papers were excellently presented with clear graphs and photographs and read in impeccable English. Miss Szemplinska also holds the Gold Badge with three diamonds—a higher honour than most of the competitors in the Championships.

The papers on meteorology included several on the jet stream as an energy source for soaring. Contact is often difficult in Europe but in the Californian projects gliders have soared above 40,000ft under the influence of the jet stream. Thermal soaring is familiar to all glider pilots but the structure of thermals is still a matter for discussion. MISS BETSY WOODWARD of Imperial College read a paper which put forward a thermal model based on model tests. One feature is the substantial radial velocity postulated. In an appendix it is explained that a sailplane circling continuously in air which has an inward radial component obtains a valuable increment to its rate of climb.

Further papers concerned wave soaring and included descriptions of wave flights in France, Hungary and Sweden.

* * *

A jury appointed by OSTIV examined the standard (15-metre) class sailplanes and flew several of them. As a result the organization's award for "the glider judged to be the best combination of cheapness, simplicity and efficiency" went to the German Ka6 sailplane, designed by Schleicher. The award for 1958 was a silver cup presented by the British Royal Aero Club.

* * *

Representatives of the seventeen member-nations attended the General Conference on June 28. The officers and board of OSTIV elected were: *President*, L. A. de Lange (Holland); *vice-president*, Dr. W. Eichenberger (Switzerland); *Board:* M. Agesilas (France), Dipl. Ing. Boris Cijan (Yugoslavia), Wolf Hirth (Germany), Dr. W. B. Klemperer (U.S.A.), Alan Yates (Great Britain).

BOMEX BY VULCAN

A Bomber Exercise from Waddington

By C. M. LAMBERT

GONE are the days when one could casually take a ride in the latest operational aircraft. Before I rode as sixth man on a Bomex mission in a Vulcan from Waddington last week, I had a full medical examination, a complete operational briefing, an emergency-drill demonstration in a mock-up fuselage and about an hour in a decompression chamber learning to pressure-breathe and checking my tolerance to altitudes. The formalities took well over a day, but the experience made it completely worthwhile.

A. V-M. G. A. "Gus" Walker, A.O.C. of No. 1 Group, in which all three existing Vulcan squadrons are operating, briefed our party on the progress in the formation of this latest and most potent element of the V-force. No. 230 O.C.U. was formed in 1955 to train Vulcan crews. In August 1956 the staff moved to Boscombe to take part in the intensive trials; and four months later production aircraft began to arrive at Waddington. By May last year, the first course had graduated and No. 83 Sqn. had come into being. Since then No. 101 has been fully formed and No. 617 is nearing full strength. The last-named is at its war-time base at Scampton and actually uses the hangar which housed some of the famous dam-busting Lancasters.

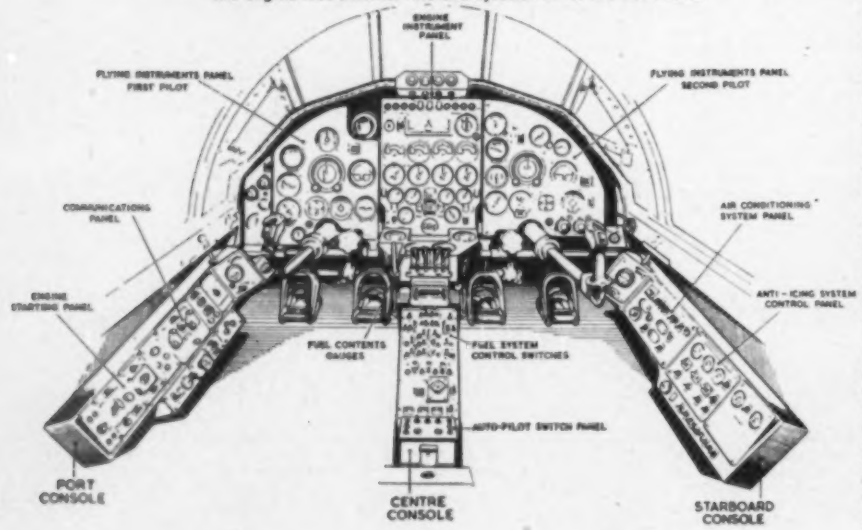
The present operational task is to work up to the peak of efficiency—and in this respect Bomber Command means business. Last year two Vulcans did remarkably well in the Strategic Air Command competition considering that they had been in existence as a unit for only a month or so. The Americans talk about dropping bombs from 40,000ft into a pickle barrel, whatever that is; and last week, the Vulcans and 14 Valiants were aiming at a manhole cover on Bovingdon airfield. Two other targets were the centre of a tower on the Little Ouse and a certain corner of a certain building near Kirkwhelpington Mill in Northumberland. All three targets were attacked during a series of criss-crossing passes over England; and this was followed by a long astro-navigation leg out over the Atlantic. It was one of a series of regular competitive exercises.

In addition, the Vulcans have a fairly heavy commitment for goodwill visits and participation in air displays which, though it might sound less than operational, is considered very important. The appearance abroad of Vulcans is excellent advertisement and propaganda—and the deterrent must be discreetly advertised if its effectiveness is to be appreciated and its purpose understood. Goodwill visits to Canada, Argentina, Rhodesia and the U.S.A. have created a weighty impression. The aircraft always arrived exactly on schedule after flying at average speeds mostly higher than 550 m.p.h. and sometimes over 600 m.p.h. Often they operated when the nearest spare engine was not even on the same continent; and yet they were never held up by unserviceability.

The first Vulcan to reach the O.C.U. flew 400 hr in four months and was given three routine 100 hr inspections in that time—a record never before achieved with such an aircraft. Flying time between major overhauls has already been raised from 600 to 800 hr. A modification is being introduced to allow the Vulcan to carry any type of existing bomber weapon without special preparation. Autopilots are being improved and fitted to allow automatic approaches with the I.L.S. already carried. Flight refuelling equipment will be added later. The latest Bristol Olympus engines in Vulcan B.1s are the Mk 104, giving 13,000 lb thrust each; but the aerodynamically improved B.2 will have 16,000 lb-thrust engines. It will carry an AC electrical generating system instead of the present complement of four engine-driven 22.5 kW generators. A 2,000 yd runway is regularly used, not necessarily with the aid of the drag chute, though this is generally streamed in order to save brake and tyre wear.

Testimony to the structural strength of the Vulcan is an incident of two or three weeks ago when a nosewheel leg, cracked by incorrect towing, shed the complete twin-wheel bogie in the air. The captain did not want to belly-land and damage the aircraft extensively and, while he flew to reduce his fuel load, Dowty were asked whether the leg was stressed for landing without benefit of wheels. The company replied in the affirmative and, after the three

The pilots' position in the Vulcan. Note the fighter-type control columns and shallow windscreen. The positions of all control surfaces are shown continuously on the rectangular panel above the engine instruments. The two ejection seats are not shown.



navigators and A.E.O. had baled out, the pilots landed the damaged Vulcan with the gear extended. Despite lack of nosewheels, the leg did not fold and no external signs of structural damage or deformation could be traced after the landing.

My own flight from Waddington last week was made in Vulcan XH 749, belonging to No. 101 Sqn. and captained by F/L. F. J. Wheeler. His crew were F/L. T. J. C. Williams, co-pilot, F/O. A. P. L. Greethurst, navigator/plotter, F/L. N. F. Mackay, navigator/radar operator and F/O. J. B. S. Horsley-Heather, air electronics officer. Crew chief of the all-important and highly trained ground/crew was C/Tech. F. J. Radcliffe, although on this occasion his place was taken by C/Tech. H. Parker-Smith. Radcliffe had been working all night.

After the briefings and a meal, we donned our suits and Mae Wests and took the air-conditioned bus to the aircraft. There, the ground/crew handed over, brief cases and rations were stowed and the pilots strapped in. The navigators followed them up the ladder through the escape hatch and climbed up on to their

The crew of Vulcan XH 749 were, l. to r., F/O. Horsley-Heather, A.E.O.; F/L. Williams, co-pilot; F/L. Wheeler, captain; C. M. Lambert, "Flight" representative; F/O. Greethurst, navigator/plotter; and F/L. Mackay, navigator/radar operator.

rearward-facing row of high-backed seats, mounted on a shelf spanning the hatchway. I was strapped to the jump-seat with my back against the bulkhead supporting the pilots' "bridge" and my legs straight out under the A.E.O.'s seat. Before my face a fire axe and asbestos gloves, to my right a bank of fuse boxes and to my left the well of the bomb-aimer's cavernous visual-aiming position beneath the pilots. All windows except the windscreen were blacked out and the three crew members set to work in their own glow of orange light. They were screened from the pilots, high behind their backs, by a canvas curtain.

Long, long check-lists preceded engine-starting and taxying. On the runway, the captain released the brakes with engines at full power just one second before our allotted time and we raced off into the evening light soon after 7 p.m. local time. Very few minutes after leaving the ground we were past 10,000ft and I struggled off my shelf and up the ladder to watch the pilots at work. Their cockpit fitted them closely and the windscreen and circular side windows appeared very small, but the instrument layout before them was simple and clear. Engine, fuel, powered services and c.g. position indicators were on the central panel, with small throttles, airbrake switch, fuel gauges, fuel-system switches and controls for yaw- and pitch-dampers and the Newmark auto-Mach trimmer spread on a long shelf between the ejection seats. Consoles along each side of the cockpit held controls for radio, air-conditioning and other services. The electrics and H.F./R.T. were managed by the A.E.O., sitting to port in the rear, while the navigators had before them the black boxes, chattering gauges and winking lights of their trade. The navigators had already spent days studying their targets and could pick out their pin-points from a radar display that was to me totally unintelligible. Doppler radar and other systems were available for straightforward navigation, while two periscopic sextants were mounted high on either side of the cabin.

Our progress, at "over 40,000ft and over 550 m.p.h.," was smooth and quiet, the voices sounding clear and close on the inter-comm. as the crew quietly went about the task of precision bombing. The run-up was begun from an initial point scores of miles from the release point; and accuracy was assessed by Radar Bomb Scoring operators on the ground who plotted the fall of the imaginary bomb and told the crew by radio where it would have struck. In the almost eerie stillness of the cabin the contrast in lighting was dramatic. Above the pitch-dark visual bombing position I could see the co-pilot reading a sheet of paper by brilliant sunlight while his instruments were illuminated by sharp electric flood lights. I sat in my twilight and looked back into the orange glow of the rear work-bench. Past the crew members' feet, themselves in darkness, I could discern numerous black boxes far away in an underfloor area lit by electric light bulbs.

We ran into a little trouble when the gyro-magnetic compass failed and we could not steer accurately enough for exercise-winning results. Clambering around with a torch, the A.E.O. checked fuses and alternators and a quiet conference was held, while the plotter guided us on towards a splendid sunset. We passed the Northumbrian target regretfully by, striving to keep on track with standby compasses and position fixes. Over the Irish sea off Lancashire we turned towards our last target at Bovingdon. No cure for the compass could be found and we passed Bovingdon too, racing smoothly over England at over 550 m.p.h.

The moment of decision had to come. Could we continue on our astro leg over the Atlantic when our compass information was severely limited and the stars were not visible for astro fixes? Although we could see street lights on the ground, we ourselves were still in sunlight; and we would chase the sun for some time after leaving the coast. Regretfully we turned back over Cornwall and crossed Wales towards Waddington, still surprisingly holding a degree of navigational accuracy. We ducked under the path of the bomber stream which we knew was still flowing down from the Irish Sea. At lower levels we hoped to reduce the fuel load to landing weight in about an hour.

During the let-down in darkness I climbed once again to the pilots' platform and observed the best-lit instrument panel I have ever beheld. Every figure and needle were crystal clear with neither glare nor blank spot. By turns the captain and co-pilot made I.L.S. approaches and overshoots until slide-rule calculation showed the weight to be low enough for landing. Then we touched down, after four hours in the air, deployed the large drag-chute and slowed rapidly to taxying speed. The parachute was jettisoned and straightaway the escape hatch was fully opened to let in fresh air. I sat by the hatchway and watched the nosewheel leg out in the summer night below our still-eerie orange-lit cabin. Soon we climbed down to the flood-lit dispersal platform, handed over to the ground/crew and a police watch-dog and repaired to debriefing and bed.

A Vulcan of No. 83 Sqn. at Waddington, slightly overpowering "Flight's" Gemini. G-AKHC is regularly used on "Flight" assignments.

HERE AND THERE

R.A.F. Britannias

ASKED in Parliament last Monday what progress had been made with the delivery of Britannias for the R.A.F. the Minister of Supply, Mr. Aubrey Jones, said: "It is hoped to put the aircraft into service around the end of this financial year and continue deliveries thereafter at the rate of one a month. Delivery should be completed some 18 months afterwards."

U.S. Navy and the NA.39

A U.S. Defense Department spokesman stated in Washington on July 8 that the U.S. Navy has no plan to buy the Blackburn NA.39 low-level strike aircraft. He said that the Navy had "given serious consideration to the question before reaching its decision."

Dutch Carrier in U.K.

THE aircraft carrier H.N.M.S. *Karel Doorman* (Capt. H. M. L. F. E. Van Oostrom Sode, R.N.N.) arrived in this country on July 8 for catapult deadload trials at Portsmouth, and—subsequently—for flying trials. The deadload trials will be run with the assistance of the Royal Navy's Flight Deck Machinery Training and Trials Unit and officers from the Admiralty will assist in the flying trials.

PRESENTED with a golden replica of the world's first liquid-propelled rocket, which her husband launched in 1926: Mrs. Esther C. Goddard, seen receiving the replica in Washington from Mr. Lewis H. Glasser at the first U.S. missile industry conference.

Visiting Cairo

THE Chief of Staff of the Soviet Air Force, Marshal Rudenko, arrived in Cairo on July 8 at the invitation of General Abdel Hakim Amer, Minister of War for the United Arab Republic. The Marshal was accompanied by a delegation of five.

The Arrow and the U.S.

THE Canadian Minister of Defence, Mr. George Pearkes, said in Ottawa recently that the best way in which the United States could help Canada to carry its heavy defence costs would be to place orders for the CF-105 Arrow twin-jet delta-wing fighter. He told the Canadian House of Commons Estimates Committee that $220m (£78,571,400) has already been spent on the aircraft, and added that as Canada would need only a limited number the cost would be high. The Arrow has already exceeded a speed of 1,000 m.p.h.

Paris Gets American C. of A.

AN American Certificate of Airworthiness has been granted for the first time to a civil jet aircraft—the Morane-Saulnier 760 Paris. M. Raymond Saulnier, president of the Société des Avions Morane-Saulnier, was presented with the Certificate by Mr. Meyersburg, chief of the C.A.A. Division in Europe, on July 7.

Germany and the Mirage III

IN Paris, on July 8, Herr Strauss, the German Defence Minister, watched a demonstration by the Dassault Mirage II fighter/bomber prototype, and later visited the experimental centre at Brétigny. It would appear that Germany's choice for an aircraft of this class now lies between the Mirage III and the Lockheed F-104.

"FLIGHT" NEXT WEEK

OUR next issue, dated Friday, July 25, will be the annual "Commercial Aircraft of the World" special number. Greatly enlarged, it will contain *Flight* cut-away drawings, with accompanying descriptions and performance data, of the new British and foreign aircraft that are likely to be in the forefront of world air transport during the coming years.

Crop-spraying Jackaroo

THE first Jackaroo to be equipped for crop-spraying plus the special Jackaroo tank has been sold to Airspray (Colchester), Ltd., using Britten Norman spraying equipment, and is to be operated in Scotland and later in the Cameroons. Even when fitted with the Britten Norman equipment, the cost of the Jackaroo as a crop-sprayer—£1,827 10s—is claimed to make it the cheapest unit of its kind in the world.

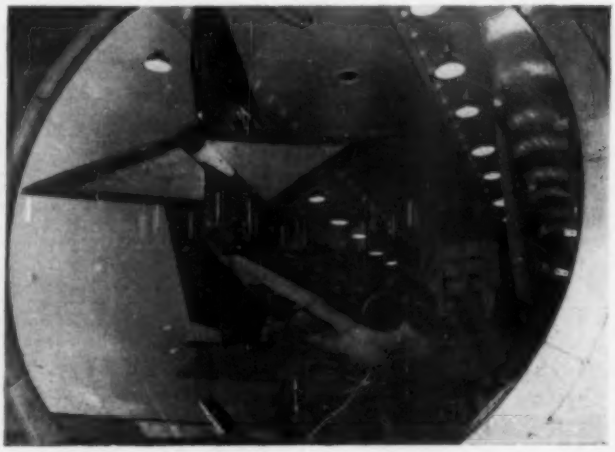
Model Flying Championships

REGISTRATIONS for the 1958 World Model Flying Championships so far total 21 countries and include 134 individual competitors. The championships, which will take place at the College of Aeronautics, Cranfield, Beds, over Bank Holiday, will be by a substantial margin the biggest such meeting ever held in Great Britain. Those countries from which entries have been received to date are: Austria, Belgium, Canada, Czechoslovakia, Denmark, Finland, Germany, Great Britain, Hungary, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, South Africa, Sweden, Switzerland, U.S.A., U.S.S.R., Yugoslavia, and (most recently) Poland. Hungary, Norway and Russia will be competing in this country for the first time. Other entries may still be received.

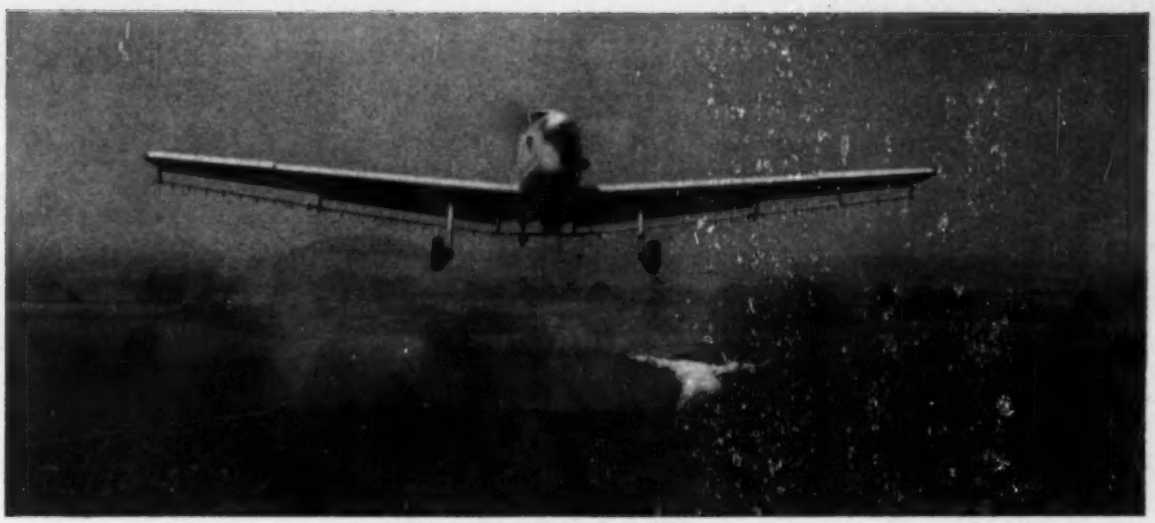
NATO CONTESTANTS: As related on page 72, the NATO formation-aerobatic contest was flown-off at Soesterberg on July 5. Although the Dutch Air Force team (top) was declared victorious, they very sportingly handed over the trophy to the Italian team, who were their guests. The Dutch team, l. to r., are Capt. P. van der Meulen Kunee, Capt. N. H. Themmen, 1st Lt. R. M. Veenhuizen, and 2nd Lt. T. C. Groothof. Above is the Greek team: Capt. John Stilianakis, Capt. Demetrius Damascos, Lt. Emmanuel Papodimitropoulos, and Lt. Stravos Firifilionis.

R.A.F. Anniversary Concert

THE third R.A.F. Anniversary Concert at the Royal Festival Hall earlier this year produced approximately £1,044 for the Royal Air Force Benevolent Fund. This is the most considerable financial result since the concert—at which Sir John Barbirolli each year conducts the massed Hallé Orchestra and R.A.F. Band—was inaugurated in 1956.



SCIMITAR ON ICE: Experimental cold chamber trials being carried out on a standard Scimitar in the stratosphere chamber of Vickers-Armstrongs (Aircraft), Ltd., at Weybridge to evaluate their use as normal winterization procedure. The tail of the aircraft has had to be "cropped" in order to make it fit.



Taken earlier this month during evaluation trials by Fison-Airwork, this photograph illustrates the Chipmunk 23 in the spraying rôle.

AGRICULTURAL CHIPMUNK

D.H. AND FISON-AIRWORK ANNOUNCE THE MK 23 VERSION

CONSIDERABLE numbers of de Havilland Chipmunk primary trainers are now coming on to the commercial market—one thousand were built at Chester for the R.A.F. and R.A.F.V.R.—and various modifications have already been described in our pages which fit the machine for club and private-owner service and clear it with the A.R.B. Now de Havilland Aircraft and Fison-Airwork have jointly produced the Mk 23, equipped for spraying and top-dressing.

Powerplant remains the 145 h.p. Gipsy Major 10, driving a fixed-pitch Fairey propeller. The chief alterations necessary to convert a Chipmunk to Mk 23 standard are: replacement of the front cockpit by a large tank-hopper; relocation of the pilot's seat in the rear cockpit to a higher position giving a better view (with correspondingly altered positions for the hand brake and fuel cock); and the addition of fixed leading-edge slats on the outer wings and slight redesign of the wing-root leading-edge spoilers, which combine to reduce the stalling speed to 35 kt I.A.S. at full load (full flap, engine off) or 29 kt light.

Basic airframe modification was the responsibility of D.H. The new canopy has bulged side panels, and the deep windscreen contains three panels of glass. The hopper is situated close to the c.g., and its location ahead of the pilot provides maximum safety for the latter in the event of a crash. Made of Fibreglass, it serves for both liquid and solid insecticides; its capacity is theoretically 88 Imp. gal or 14 cu ft, although the certificated load is 560 lb. At the top it overlaps the fuselage, forcing any spilt contents to run down the outside of the aircraft, which is finished with chemical-resisting paint (the Chipmunk is all-metal).

Design of the dispensing equipment and controls was handled by Fison-Airwork, Ltd. When operating with liquid insecticides a full-span spray-bar system is fitted, providing a 90ft swath and having the advantage of being particularly close to the ground, owing to its location beneath the low-mounted wing. The contents of the hopper are gravity-fed to a windmill-driven pump fitted with a brake. A dump valve is provided for jettisoning the fluid, the time taken to do this being reduced to 5 sec by a projected modification. For solid insecticides a special discharge chute is fitted. The hopper lid has an area greater than 2 sq ft and the surround is stressed to bear the impact of a 112-lb sack.

It is possible to convert the Chipmunk Mk 23 to serve as a "½-ton truck" by replacing the hopper by a Fibreglass freight container with a flat floor and a passenger seat. This conversion, in each direction, takes about 30 min. It is also possible to provide the aircraft with full night and blind-flying equipment, and with radio.

At present the prototype Mk 23, G-APMN, is being intensively evaluated by Fison-Airwork and it appears to be performing very satisfactorily. A market survey of the prospects for the type is now in hand.

D.H. CHIPMUNK Mk 23

One de Havilland Gipsy Major 10 engine

Span, 34ft 4in; length, 25ft 5in; height over canopy, 7ft. Weights: empty, about 1,450 lb; gross weight, 2,420 lb; normal max. landing, 2,100 lb. Performance at max. wt., I.S.A.: take-off to 50ft with 15 deg flap, 1,392ft; initial climb, about 500ft/min with 8 per cent gradient; typical cruising speed (dummy spray bars, no windmill, using 2,250 r.p.m. at 1,000ft), 75 kt; landing from 50ft using brakes, 1,593ft.

Elimination of the front cockpit, and the addition of slats, spray bars and a higher canopy, give the aircraft a distinctive appearance.

The Anti-Bomber Missile

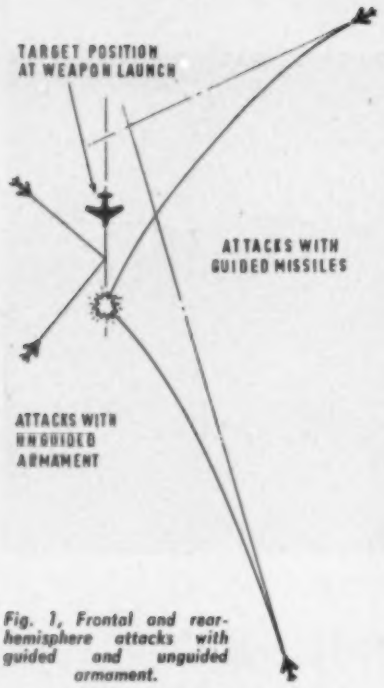


Fig. 1, Frontal and rear-hemisphere attacks with guided and unguided armament.

By J. A. AIREY *

AN ANALYSIS OF ITS ECONOMICS AND ADVANTAGES

TEN years ago the air-to-air guided missile was a new and exciting invention. It has now reached a stage where it has become a reliable and very effective fighter armament, capable of continuous development to keep pace with improvements in enemy bomber performance. Despite this, there appears to be a growing belief that fighter defence systems are obsolescent, so that any discussion of the future of air-to-air missiles must begin with a reassessment of the rôle of the fighter.

The Government's White Paper on Defence, published on February 13, 1958, acknowledges that, while Russia has been making great strides in the field of nuclear weapons and rockets, her basic strength lies in her overwhelming superiority in conventional armaments and military manpower. It states that the Soviet Union and her satellites have over 200 divisions facing the West, about 20,000 aircraft, and a fleet which includes some 500 submarines, and that NATO strategy is based on the frank recognition that a full-scale Soviet attack could not be repelled without resort to massive nuclear bombardment of the sources of power in Russia.

We must accept that the result of such a bombardment would be massive nuclear retaliation. At present, the means of delivering a nuclear attack is the manned bomber, but recent rapid strides in missile techniques, evidenced by the launching of space satellites, leaves little doubt that during the next decade the ballistic missile will to an increasing extent take over the rôle. In the uneasy situation where peace is preserved by the power of the deterrent there is a temptation to conclude that defence, in the traditional sense of repelling enemy attacks, is an outmoded philosophy. In fact, an effective system of defence against manned-bomber attack was never more important.

The policy of deterring aggression by building up enormous power of retaliation may well have the desired effect of preventing a major war between the great Powers. It must, however, if it is successful, release the vast "conventional" Soviet forces for use in perimeter wars which do not, in the eyes of the West, justify nuclear retaliation and the inevitable national suicide which would result. Until a general agreement on disarmament is reached, those 20,000 aircraft must remain a major threat to world peace, and a mobile system of defence against them is vital.

Ground-to-air Missiles. The existence of the intercontinental ballistic missile has not only diverted attention from the manned aircraft threat; it has also influenced our thinking on the means of defence against it. Devices which navigate accurately without the assistance of the human operator have an irresistible appeal and many of those who recognize the manned aircraft threat regard the ground-to-air missiles as the obvious means of defence against it. They will claim that the day of the manned fighter is rapidly coming to an end and that the functions of the human pilot will soon be performed electronically. This is not a view which can be dismissed out of hand. The advantages of manned and unmanned intercepters must be carefully assessed. The important ones are obvious and can be tabulated as follows:—

Piloted Intercepter	Ground-to-air Missiles
(1) Generally longer range.	(1) Greater rate of climb and higher speed leads to more rapid interception. No airfield required.
(2) Capable of switching from one target to another and of loitering or patrolling well away from base.	(3) May require smaller maintenance teams.
(3) Most expensive part of system recoverable and may be used many times.	(4) No necessity for expensively trained air crew.
(4) Faults in equipment may be overcome by intelligent operator.	

These points may be argued and added to by enthusiasts. Some may claim that the range of ground-to-air missiles can and will be increased, others that VTOL aircraft are being developed to obviate the need for airfields.

The argument can be endless or it can be ended very simply by the recognition that as a defence against enemy bombers, manned fighters and ground-to-air missiles are complementary and will always be so. Fighters have flexibility and may be moved rapidly to the scene of the conflict but ground-to-air missiles may have an essential rôle to play in the close defence of areas of special strategic importance.

The recent Air Estimates suggested that this view is becoming accepted among the politicians who have the task of allocating our limited financial resources between the various forms of defence. These Estimates show no sign that the ground-to-air missile is superseding the manned intercepter.

Fighter Armament. If we accept that the manned fighter must continue to be developed as a defence against the manned-bomber threat, the armament it carries is of vital importance. In discussing the alternatives available it is necessary to say something of the general technique of interception.

Initially the bomber approaching the area under attack, and the fighter defending it, will be flying on approximately reciprocal courses. If the fighter has the speed advantage it may be turned into an attacking position in the rear hemisphere, but if it has not it may be forced to launch a frontal attack. As the turn into a rear attack position takes time, it usually leads to greater penetration by the target; but, because the final approach is made with a comparatively low closing velocity, the time available is such that a second attack is possible if the first is seen to fail. In frontal attacks the time available to the fighter pilot is very short.

In either kind of attack two types of weapon must be considered. It may either be unguided and fired on an accurately computed course, with due allowance made for dispersion at launch and the effects of gravity, or it may be capable of guiding itself on to its correct collision course during flight. The unguided missile will be much simpler and cheaper, though it will involve a computer in the fighter to calculate the correct firing course. It must also be launched at short range, as otherwise it may fail as a result of evasive manœuvre by the target. The guided weapon, on the other hand, may be fired from long range, with considerable aiming tolerances, and from well below the target

* *Technical sales manager (guided weapons), de Havilland Propellers, Ltd.*

altitude. This last advantage is of particular importance in that it allows a fighter to attack targets well above its own ceiling.

Frontal and rear-hemisphere attacks with the two types of weapon are shown in Fig. 1. It should be noted that the angle through which the fighter must turn is always less in the case of a guided weapon, and this is particularly important in frontal attacks when the time available for the final course correction by the fighter is short. It is a solemn thought that if a fighter flying at 1,000ft/sec makes a frontal attack against a target travelling at the same speed, launching an unguided rocket at 1,000 yards range, the fighter pilot has 1½ seconds in which to avoid a collision.

To summarize, therefore, guided weapons have the advantage that:—

(1) Since they can be fired at a longer range, they greatly reduce the vulnerability of the fighter, and also allow the fighter to attack targets well above its own ceiling.
(2) They can be fired with considerable aiming tolerance and reduce the total turn demanded of the fighter.

To these advantages must be added the fact that guided weapons can be made to "home" on the target with great accuracy and can carry a large warhead of great destructive power, operated by a proximity fuze.

The picture would be incomplete, however, without mention of the unguided rocket with nuclear warhead. In this, aiming errors, dispersion after launch, and evasive manœuvre by the target may all contribute to a large miss distance which is compensated for by the power of the warhead. No details of these weapons have been published but from their size it appears that they would considerably affect the performance of the launching aircraft and reduce its chance of reaching a launching position. However, if they are launched correctly their lethality must be very high, and they may well be useful in global war. Since their use obviously invites nuclear retaliation they are unlikely to be used in perimeter warfare, and must be classed as part of the deterrent, rather than as a means of defence.

Cost of Fighter Defence Systems. While it is generally accepted that guided-missile armament is much more effective, for reasons discussed above, than unguided rockets, the cost of these sophisticated modern weapons may be held to outweigh their advantages. In fact, though more expensive in themselves, guided missiles usually lead to a cheaper defence system as a whole. This can be illustrated by a simple statistical argument. The effectiveness of a fighter defence system depends on two main factors:—

(1) The probability of getting the fighter into the vicinity of the target in a position where its armament may be fired; and
(2) The probability that the armament, launched correctly, will destroy the target.

To assign values to these two probabilities involves consideration far beyond the scope of this article, but in making a comparison between guided and unguided armaments it is sufficient to generalize. The probability of getting a fighter into a position to fire its armament depends on the effectiveness of the ground-control system, the navigation aids in the aircraft, the extent of the weapon-firing zones and the tolerances on the firing direction. There can be no doubt that guided weapons have much greater firing zones than guns or unguided rockets and the tolerances on firing directions are much greater.

The lethality of the armament depends on reliability, warhead size and, in the case of a guided missile, on homing accuracy, fuze design and the effectiveness of enemy countermeasures.

Having assigned probabilities of success to each of the two phases it is a simple matter to calculate the number of fighters required to achieve a certain degree of success against a given enemy raid. Suppose the aim is to destroy 45 bombers out of a raid of 50, Fig. 2 shows the number of fighters required if they are equipped with guns or unguided rockets, and Fig. 3 shows the number necessary if each carries two guided missiles. If the probability "q" of reaching a position to fire guns or unguided rockets is 50 per cent and the probability "p" of these weapons achieving a kill is 30 per cent, Fig. 2 shows that the number of fighters required is 710. If, on the other hand, the fighter is equipped with guided weapons, whose firing zone is much more extensive, whose aiming tolerances are much greater, and whose kill probability is much higher than that of guns, the number of fighters required is greatly reduced. For example, if the probability of reaching a firing position is increased to 80 per cent and the probability of kill of each of the two guided missiles is 80 per cent, the number of fighters required is reduced to 79. It must be remembered that as the number of fighters required increases, the problem of controlling them from the ground becomes much more complex, and the probability of any one fighter reaching an attacking position is reduced.

The argument thus becomes almost entirely a financial one. If a fighter defence system is to be economic as well as effective, it is essential that the probability of kill of each fighter/weapon combination is made as high as possible, so that the number of fighters is reduced to a minimum. In the design of such a system, fighter speed, manœuvre and endurance are important, but performance claims are meaningless unless they refer to the aircraft fully equipped with the radar aids necessary to complete the interception, and the weapons capable of destroying the target. The radar aids and guided missile armament are both essential if the probability of reaching the firing position is to be increased to its maximum value, and the latter is necessary to ensure the highest probability of kill.

It is clear that the two probabilities under discussion are not independent; the greater the firing range of the weapon, and the larger its warhead, the greater will be its size and weight and the more will the performance of the parent fighter be affected. For this reason the modern air-to-air weapon must be designed in close collaboration with the aircraft manufacturer; but it is clear that with this proviso it can also result in a much more effective and, therefore, economic defence system.

Guided-missile Developments. The statistical argument outlined above, and the earlier remarks on types of fighter interception, indicate clearly the lines along which air-to-air guided missile development must proceed:—

(a) The zones from which weapons may be launched must be increased.
(b) Tolerances on firing direction must be widened to reduce to a minimum the manœuvre required of the fighter.
(c) The probability that the weapon will kill the target when launched correctly must be increased to its maximum possible value.

It is instructive to consider the various types of air-to-air guided missile available or capable of development with these requirements in mind.

The earliest types of such missile operated on the beam-riding principle, being constrained to follow a radar beam laid by the fighter on the target. Though these weapons operate successfully and various types are now in squadron use, they have the obvious limitation that they impose considerable restrictions on the course flown by the fighter before and after missile launch. They are now being superseded by homing missiles.

A missile will automatically home on a target by steering itself on to a correct course for collision, if its manœuvre is made proportional to the rate of turn of the line of sight from the missile to the target. Homing missiles differ from one another in the method by which the line of sight is established. The missile guidance system is usually made to lock on to, and automatically follow, the movement of the target, and the rate of turn of the line of sight is measured. These guidance systems are of three main types.

Active-radar-guided missiles are designed to transmit radiation and also collect that part of it reflected by the target, thereby establishing the line of sight. In semi-active radar missiles, the

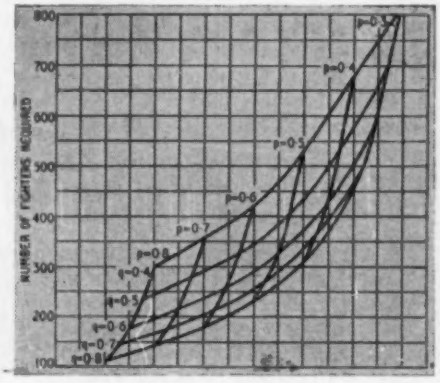


Fig. 2, Plot of the number of fighters required to intercept and kill 45 out of 50 bombers using gun armament: p, lethality of armament; q, probability of getting into firing position.

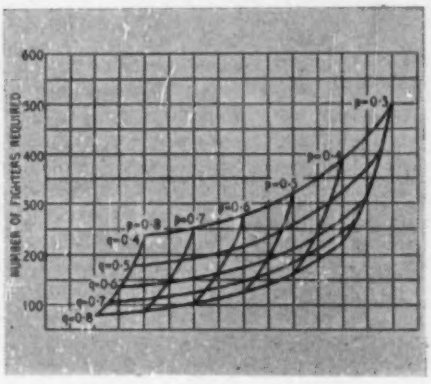


Fig. 3 (far right), Similar curves for fighters using two guided missiles each (no guns).

THE ANTI-BOMBER MISSILE . . .

transmitter is carried in the parent aircraft and is, in fact, usually the airborne interception radar so that only the receiver is carried in the missile. The active system results in a larger and heavier missile and, although it removes the need for the aircraft to continue to illuminate the target with its radar during missile flight, a semi-active system is to be preferred in a modern fighter equipped with an effective interception radar. The third type of guidance commonly employed makes use of the infra-red radiation emitted either by the target engines or by kinetic heating of its structure.

It is not possible here to make a detailed comparison of radar and infra-red guidance. Each has advantages; radar waves can penetrate the worst weather conditions but are susceptible to enemy countermeasures; the faster the target, the more infra-red radiation it will produce, and because homing on an infra-red source can be made extremely accurate, infra-red homing missiles can usually be made smaller and lighter than their radar counterparts. Both types will continue to be used unless they can be combined in a single system, sensitive to both infra-red and radar frequencies.

Firing range must depend on the range of the guidance system and also the aerodynamic range of the missile. It is in this aspect of weapon design that a close liaison with the aircraft designer is essential. Longer range inevitably leads to a larger missile and greater deterioration of aircraft performance, and the optimum can be achieved only by detailed study of the aircraft/weapon combination.

The permissible aiming error depends on the manœuvrability of the weapon and its flight time. The very high manœuvrability essential in a modern air-to-air missile can be achieved by large wing area or low weight, and again a compromise solution involving the effect of the weapon on aircraft performance is essential.

All these factors—type of guidance, firing range, and aiming error—directly affect the probability that the parent fighter will reach a firing position, and also influence it indirectly through their effect on the size and weight of the missile installation.

The lethality of the weapon, provided it is fired correctly, depends on its homing accuracy, warhead size and fuze design, and above all, on its reliability. To achieve a small miss distance and a really effective proximity fuze must lead to some complexity and it must be the aim of the missile designer to ensure that complexity does not lead to unreliability. There is no reason why it should, provided the whole missile is designed from the outset for ease of servicing and maintenance under the most stringent operational conditions. The increased cost of the weapon as its design becomes more sophisticated is unimportant, provided it leads to higher lethality and consequent reduction in the size of the defence force.

Conclusion. Defence against air attack by manned bomber aircraft will be essential for many years to come, and the piloted fighter equipped with the necessary radio aids and guided weapon armament will continue to have a vital rôle to play. In this article, fighter armament, which is a particularly important aspect of the defence system, has been considered in more detail than aircraft performance, ground control and other radar interception aids, but it is clear that if the system is to be efficient and economic all its components must be carefully integrated. A high degree of co-operation between the industries involved is therefore essential, and in recent years close collaboration at all levels has been built up. Given continued Government support, there is no doubt that fighter defence systems with guided weapon armament can and must continue to be developed to meet the bomber threat.

THE SOESTERBERG DISPLAY

TO commemorate the 45th anniversary of the Royal Netherlands Air Force a NATO air display was held at Soesterberg, Holland, on July 5. A Netherlands correspondent describes it as follows: It was to be expected that the display would be similar to that at Liége a few days earlier. And so it was. The principal difference was that at Liége the U.S. Navy participated. On the other hand, Soesterberg saw an impressive flypast by a B-52 of Strategic Air Command which had flown direct from the United States. A U.S.A.F. colonel at the airfield had been in constant radio contact with the bomber as it had crossed the Atlantic at 41,000ft, with an outside temperature of −38 deg C.

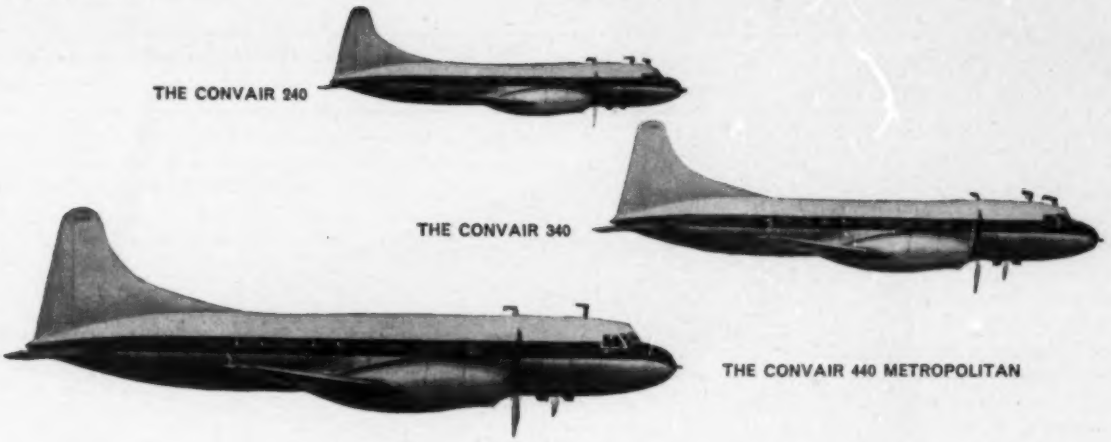
The main programme opened at 3 p.m., after the arrival of nine Hiller helicopters of the Dutch Army. In the first flew Her Majesty Queen Juliana, in the second Prince Bernhard, in the third Princess Beatrix, and in the fourth Princess Irene. Among the spectators were Marshal of the R.A.F. Sir Dermot Boyle and Gen. Curtis LeMay, whose personal KC-135 was to be seen.

A flypast of old-timers included a Caudron G.3, an R.A.F. Lincoln and two R.A.F. Spitfire 16s—one of them flown by S/L. Carsen, who was shot down near Rotterdam in 1944 and subsequently escaped to England. Fifteen Gloster Meteor 8s flew the flags of all fifteen NATO countries. The presentation of the white Vickers Valiant and Avro Vulcan was very impressive and many Dutchmen saw these beautiful machines for the first time. A Lockheed C-130 Hercules unloaded 86 armed soldiers and a Blackburn Beverley unshipped a Bristol Bloodhound. The amazingly short take-off run of the empty C-130 was one of the most impressive items of the whole show. The Skyblazers and the "Black Arrows" of No. 111 Squadron, R.A.F., performed (the Arrows putting up an exceptionally fine show), and three of the pilots from the R.A.F. formation were judges in the contest for the NATO championship formation flying. They awarded 72 points to a Dutch F-84F squadron from Volkel, 62 to an Italian F-84F squadron, and 56 to a Belgian Hunter squadron. The Dutchmen very sportingly gave the cup to the Italians as guests.

Among aircraft demonstrated were the Kolibrie light helicopter, the Breguet Taon strike fighter, the Fouga Magister, the Alouette and Djinn, and the Do 27 (a fantastic performance by Schaefer). A KB-50 refuelled an RB-66 and two F-100s, and twelve F-100s of an American squadron based at Soesterberg made an afterburner take-off. Lockheed F-104s and McDonnell F-101s appeared, but their flypasts were relatively slow. One heard that the Skyblazers are to re-equip with F-101s and that fighter/bombers of the same type are to be stationed in Germany.

Eighty Belgian and forty Netherlands parachutists made a drop from three C-119s of the Belgian Air Force and three C-47s of the Netherlands Air Force. Much of the final NATO flypast had to be cancelled because of poor weather.

Left below, A mixed Netherlands formation comprising a Fokker S.14 in the lead, a Hunter (left), F-86K Sabre (right), and a Meteor F.8 in the box. Right, A study in tail booms, afforded by a Hiller of the Dutch Army and the Blackburn Beverley, unloading its Bristol Bloodhound.



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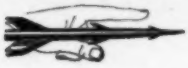

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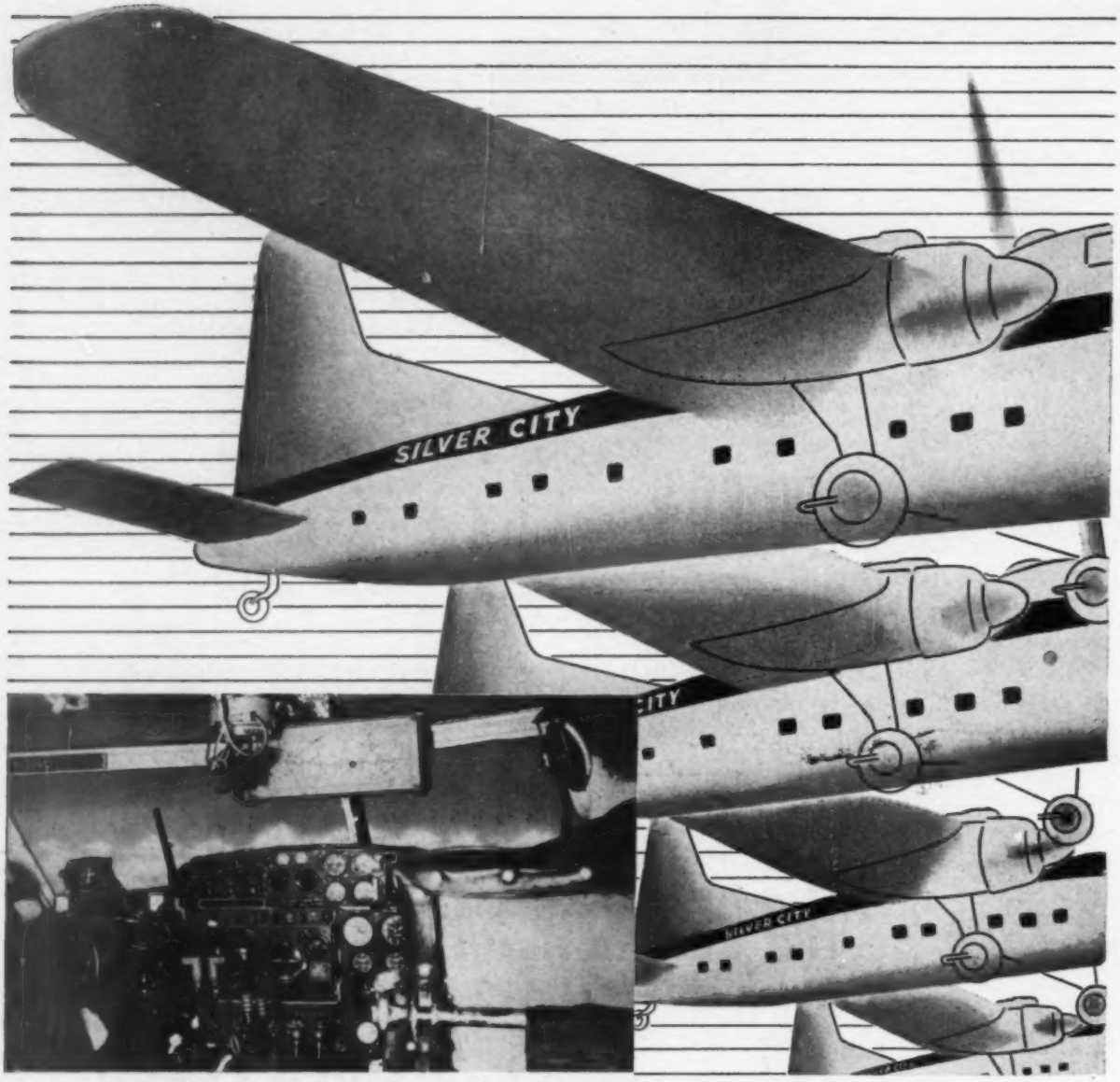

Silver City's success with

THE DECCA NAVIGATOR

The tenth anniversary of the Silver City Air Ferry is a fitting time to reflect upon the important part The Decca Navigator has played during recent years in maintaining the Company's excellent operational record.

Trials of the prototype Decca Flight Log were first carried out by Silver City in 1951 and during the past three years the equipment has been installed in 27 of the Group's aircraft, including 14 Air Ferry Bristol Superfreighters.

During this time the serviceability factor has averaged 97.5% and the equipment has made a valuable contribution to the efficient working of the service under all conditions. Both crews and traffic controllers are unanimous in their praise for The Decca Navigator, particularly in maintaining a smooth traffic flow through the complicated systems of air traffic control over the Channel.

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THE PIAGGIO P.149-D IN FLIGHT

By JAMES HAY STEVENS

THE Piaggio P.149-D is a dream aeroplane—cruising at a genuine economical 145 m.p.h. with four passengers and baggage, or even five passengers, and as lively in every aerobatic as the most exacting virtuoso could desire. Add to this, delightful controls plus a need for co-ordination but a forgivingness which preserves the undeserving pilot from the consequences of error, and one has an ideal combination trainer and tourer.

The P.149 was originally adapted about three years ago from the tailwheel P.148 primary trainer—itself an aeroplane with exquisite handling qualities—as a four-seater tricycle tourer. Then it was re-engined with the 260 h.p. GO-480 in place of the 180 h.p. O-435 and offered to the Aeronautica Militare and the Luftwaffe as a communications aircraft—only to be accepted as a basic trainer by the Germans.

Structure. Structurally it is a simple aeroplane of classic sheet-metal design, manifestly from the same stable as the P.136 and P.166. In the Piaggio tradition the wing has two spars, the front one taking bending loads and the rear forming the fourth wall of a torsion-box with the skin, as well as carrying the aileron and flap hinge brackets. The ribs are flanged pressed blanks. Welded-steel brackets are used for the control and undercarriage hinges, and the spar-root fittings are machined steel forgings. The metal flaps and ailerons have minimum internal structure, the skin being stiffened by impressed chordwise beads.

Fuselage construction employs channel-section ring frames, notched for the stringers. There are no longerons, but the U-section frames at the large cockpit opening are joined by sturdy longitudinal members. There are bulkheads at the front and rear of the cockpit and two at the tail, as well as substantial under-floor cross-beams for fittings to which the wing spars are bolted.

Tail-unit fixed surfaces are miniature replicas of the wing, while the control surfaces are similar in construction to the ailerons, with bead-stiffened skin.

The undercarriage has three piston-type compression legs with welded-steel fabricated half-forks and scissor torque links. The main legs are fully cantilever, but the nosewheel has a crosshead with side-load bracing tubes. Retraction is by a centrally placed electric motor which, via push-pull tubes connected to levers at the legs, retracts the main wheels outboard and the nosewheel aft. Emergency lowering is by a hand crank between the pilot's seats.

The flat-six Piaggio-built Lycoming GO-480-B1A6 is installed on a steel-tube engine mounting in a characteristic cowling with exhaust-induced cooling airflow. The Piaggio P.1033/G4/D/A metal-bladed hydraulically operated constant-speed airscrew has a diameter of 7.21ft and a pitch range of 10 deg to 30 deg.

The cockpit is spacious, the bench-type rear seat comfortably accommodating two plump people or three less well-fed ones. There is a fine all-round view from each seat, and the pilots' forward view is perfect at all angles. Controls are well positioned: pull-up flap lever between the seats; pitch, throttle, fuel cut-off, undercarriage and trim centrally (pitch and throttle duplicated on the port side); flying panel in front of the port seat, engine instruments centrally; starting controls at the port edge of the dash; electrical and radio switches overhead on the windscreen frame. Canopy latch and jettison lever are in the roof. The noise level is fairly high in the military aircraft, but speech, as opposed to yelling, is practical without headsets.

Flying. My personal introduction to the P.149-D was a trip along the coast from Nice to Villanova d'Albenga with Commandante Aldo Gasperi, Piaggio's chief test pilot, an ex-fighter pilot who has ensured the refined control characteristics of all the post-war types. This 25-minute flight, with a wonderful 145 m.p.h. unfolding Cinerama of the Riviera's toy-like coastline, emphasized what an attractive tourer the P.149-D would make.

Our next meeting was during a partial lifting of the all-pervading low cloud, for an hour's circuits and bumps sandwiched between 600ft hills (see photograph) and a 900ft cloud-base.

Starting is by direct-cranking electric starter (tank booster pump ON) after having primed by hand—the fuel cut-off is used to "catch" the engine if it is reluctant. Starting is on No. 1 mag only. Direct mechanical connection of the rudder pedals to the nosewheel gives precision steering at all speeds without recourse to the toe-pedal hydraulic brakes—a safety feature which, I feel, should be on all light aeroplanes. The forward taxying view is better than the road view on most cars.

For take-off one sets elevator trim neutral, fuel booster pump ON (mixture is automatic), max. r.p.m., flaps two notches (18 deg). Acceleration on opening the throttle (30in Hg, 3,400 r.p.m.) is a genuine kick in the pants, and some right rudder is required as the torque and slipstream take effect. There is a rudder trim, but it is only necessary for precision trimming to cruise hands and feet off; the full-throttle rudder bias is *far* less tiring than that on, say, a Tiger Moth. The P.149-D can be lifted off at 45 kt I.A.S. and accelerated safely—with full lateral control—in an amazingly taildown attitude, which can be an advantage on rough grass, since it eases nosewheel loading. The runway technique is to ease the stick back to lift the nosewheel (so that it slows down before retraction), then at 60 kt I.A.S. to fly off.

Then: brakes to stop the wheels; u/c UP (three-position toggle switch); reduce to 25in Hg manifold pressure; 3,000 r.p.m.; booster pump OFF; raise flaps gently. Climb seemed to be rather better than 1,500ft/min at 100 kt s.l. I.A.S. Reduce to 2,800 r.p.m. and 23in Hg for cruising—rather less to keep circuit speed down.

The controls are light and sensitive; and, although well harmonized, the elevator is noticeably the least light—a gearing modification introduced in the military trainer to inhibit overloading. The rudder is practically unnecessary, save at take-off, in very steep turns, and for aerobatics.

On a later occasion, the only morning in a whole week when the sky cleared, we climbed to 10,000ft for aerobatics—and still obtained 750ft/min at 80 kt I.A.S. This time we were in a Luftwaffe aeroplane, where one was greeted, amid a sea of alien notices, by the familiar dials of a Smiths A.S.I. calibrated in knots and a Kelvin Hughes altimeter marked in feet—albeit labelled *HOHE*—and a manifold pressure in decimals of one *Ata*.

Commandante Gasperi produced the whole gamut of aerobatics, including a full roll inserted on the top of a complete loop and his own particularly smooth over-the-vertical Immelmann turn.

The stall is very innocuous indeed. It requires a whiff of throttle (to keep the Lycoming from spitting) and plenty of backward stick to get the nose up and the speed down. At about 40 kt I.A.S. there is some buffering, although lateral control remains effective. The stall occurs "off the clock," when the nose drops. If the stick is kept back, the aeroplane nods its way down and the slightest easing of the stick puts it into a glide. If a wing goes down, it can be picked up at once with rudder.

Spinning requires the P.149 to be thrown in with full elevator, rudder and some aileron at 60 kt (its predecessor, the P.148, never would spin for me, although Gasperi could do it every time). The A.S.I. read 80 kt, but nevertheless it appeared to be a true spin and not a spiral. After a couple of turns rotation becomes very fast, but recovery is normal after giving full rudder, then full elevator, control forces being quite light and the ensuing dive barely exceeding cruising speed and perhaps 2g. Five turns and the pull-out take about 2,000ft.

The good stalling and spinning characteristics would appear to be due to the wing aerofoil washout from a bi-convex root to a cambered tip, to the long tail arm, and to careful blending of the fuselage lines.

Returning to the circuit, the undercarriage is lowered at 100-110 kt and speed is then reduced to 70 kt to make flap lowering easy. The pull-up lever is released by pressing a button in the tip and easing in the opposite sense and only the last notch (43 deg) is a little awkward. The elevator becomes very heavy with flap and requires full trim for comfort and safety in the glide, although the stick force is always within one's physical capabilities. The best approach speed thereafter is 80 kt, reducing to 70 kt over the hedge on cutting the throttle.

The rudder is unnecessary on the approach, all steering being done on the ailerons right to the touchdown—in fact, introduction of yaw through the rudder tends to over-controlling. Rather deceptively, there is no fade-out in elevator feel as the stall is approached and the P.149 is flared out to a tail-low touchdown on the main wheels alone. Once on the ground it runs true and, even without brakes, decelerates quickly.

PIAGGIO P.149-D.

(Piaggio-built Lycoming GO-480-B1A6, rated at 260 h.p. and driving a geared, variable-pitch propeller)

Dimensions: span, 36ft 6in; length, 28ft 9½in; height, 9ft 6in.

Weights: equipped, 2,557 lb; fuel and oil, 397 lb.; pilot, 170 lb; payload limit 580 lb; gross, 3,704 lb (aerobatic, 3,197 lb).

Performance (normal category): level speed at sea level, 189 m.p.h.; typical cruise, 160 m.p.h. at 7,000ft; take-off (18 deg flap), 835ft run, 1,330ft to 50ft; climb, 3 min 28 sec to 3,280ft and 13 min 49 sec to 9,840ft; practical ceiling 16,400ft; max. range at 10,800ft at 145 m.p.h. (146 h.p.), 675 miles; landing (43 deg flap), 670ft run, 950ft from 50ft; stall with full flap, 63 m.p.h. NOTE: V_{NE} is 230 m.p.h. (252 in aerobatic category).

What is a Powered Flight?

PUTTING HISTORICAL CLAIMS INTO PERSPECTIVE

By CHARLES H. GIBBS-SMITH, M.A.(Harvard), F.R.S.A., F.M.A., Comp.R.Ae.S.

TO qualify for having made a powered and sustained flight, a conventional aeroplane should have sustained itself freely in a horizontal or upward flight-path—without loss of air-speed—beyond a point where it could be influenced by any momentum built up before it left the ground: otherwise it will only rate a powered take-off, leap or glide—i.e., it will not have made a fully self-propelled flight, but will have merely followed a ballistic trajectory modified by aerodynamic factors. Furthermore, it must be shown that the machine can be kept in satisfactory equilibrium. Simple sustained flight obviously need not include full controllability, but the maintenance of adequate equilibrium in flight is part and parcel of sustentation.

Before any performance can be accepted as a powered and sustained flight, a number of possibilities should be well and truly ruled out, the influence of any of which would be disqualifying: they are (a) that the machine might have had a mechanically assisted take-off; or (b) that it might have run downhill before take-off; or (c) that it might have accelerated along the ground and then been made to "jump" into the air by the sudden action of its elevator; or (d) that it might, after propulsion along the ground, be launched into the air suddenly by meeting a rise or declivity of the ground. Two or more of these happenings could easily have been combined.

If any of these possibilities cannot be ruled out from a claim, the alleged flight cannot be accepted as sustained, and a "flight" which is not sustained cannot be called a flight in this context, as it denies the purpose of the engine. Even totally unflyable aeroplanes—as well as many objects which are not flying machines at all—can be made to leap through the air for considerable distances, and may not deserve any more credit than an automobile which rides through the air after meeting a hump-back bridge at speed. Wilbur Wright once wrote:—

> "From our knowledge of the subject we estimate that it is possible to *jump* about 250 feet, with a machine which has not made the first steps toward controllability and which is quite unable to maintain the motive force necessary for flight. By getting up good speed a machine can be made to rise with very little power, and can proceed several hundred feet before its momentum is exhausted. . . . There is all the difference in the world between jumping and flying."

Where equilibrium is concerned, the machine should have been demonstrably maintained in equilibrium for longer than the few seconds during which it might have survived in the air fortuitously.

Finally, quite apart from the physical possibilities involved in claims to powered flying, there are important psychological possibilities to be taken into account, such as wishful thinking on the part of both experimenters and onlookers at the time, and in later years; lapses of integrity under stress of pride, jealousy, etc.; lapses and telescopings of memory, etc. Particularly suspect, for obvious reasons, are those claims advanced long after the alleged events. Also, of course, there is the overall question of assessing the reliability of the evidence being examined.

From what has been said above, it is clear that the imponderables may be formidable; but in practice they appear formidable only if we allow ourselves to become involved in hair-splitting and fruitless arguments about events which were relatively slight. I would emphasize the word *relatively*, as the efforts to fly were often of absorbing interest, and remarkable for their ingenuity and "guts." But unless we distinguish clearly between tentative efforts and true and manifest accomplishments, we are in danger of making nonsense out of history.

It was to help clarify the historical perspective on claims to powered flying that I recently suggested—and the Director of the R.A.E. agreed—that a minimum distance of *about* a quarter of a mile (1,320ft) through the air should stand as a modest criterion of a simple powered and sustained flight by an apparatus which, after all, was built to "navigate the air." I cannot believe that anyone who is truly concerned with aviation history can ever seriously accept as powered flights those passages through the air of a hundred or two feet, lasting some four to five seconds, and measuring at most about ten times the length of the aircraft.

Two claims to the very first powered flights may be ruled out at the start; those for the Mozhaiski machine in 1882, and the Maxim machine in 1894. The former took off down a "ski-jump" ramp, and the distance thereafter is not recorded; and Maxim had upper restraining rails, the absence of which would have been just as likely to have resulted in an immediate crash as in a sustained flight. A third claim—that of Jatho in 1903—has only recently been advanced, and may be ruled out owing to its shadowy nature: in any case the maximum distance claimed was only some 197ft.

We now come to Ader's *Eole* in 1890. The airborne distance claimed was "about 50 metres" (164ft) which was some ten times its own length (about 16½ft). Ader himself said the machine had "insufficient stability," and described the test as "*cette tentative.*" Charles Dollfus, who has made the most exhaustive study of Ader, says that the test was not a sustained flight, and only claims it as the first powered take-off. As for the claim of 300 metres (984ft) made for Ader's *Avion III* in 1897, Dollfus points out that it was not until nine years after the event—despite "claimless" published descriptions by Ader in the meantime—that Ader and his friends made this claim, when they heard of Santos-Dumont's early trials in 1906: whereas we have the detailed and scrupulous official eye-witness report by General Mensier (who was friendly to Ader) which indicates that at no time were more than one of the three wheels clear of the ground, as shown by their tracks. Incidentally, the *Avion* had no elevator control at all, and an inadequate rudder, among its many defects.

Of the claim that in May 1908 Cody's machine left the ground for 150ft—less than five times its own length (36ft)—it may be said that this claim also was not put forward until many years after the event; in any case I have already written enough about this, and Cody flew a good 1,390ft in October.

The claim that A. V. Roe's biplane flew 150ft (his own maximum claim) in June 1908—less than seven times its own length (about 23ft)—was not put forward until long afterwards, although brief "hops" seem certainly to have been made. But Roe himself, his son says, "considered flights up to 1,500ft failures," thus aligning himself with my quarter-mile criterion: the plaque at Brooklands unveiled by Roe in 1954 refers only to "flight trials," and Capt. Pritchard to "the first time a British-designed and British-built aeroplane had got off the ground."

Santos-Dumont, in 1906, "flew" about 200ft in October and 722ft in 21 sec in November, in his highly unpractical "14-*bis*," i.e., some 20 times its own length (about 37½ft). These efforts were hailed by the French, who had been actively struggling to get off the ground since 1903; and in that frustrated atmosphere of non-existent standards, they were—and are still (grudgingly)—accepted as the first powered flights in Europe.

Lastly, the Wrights. On December 17, 1903, against a stiff wind—unlike the others—they were airborne for 12 secs at the first take-off, and covered some 470-600ft through the air (approximately 120ft over the ground): the fourth flight that morning lasted 59 sec and covered about half a mile through the air (852ft over the ground), the equivalent of flying in calm air—which the others had—the length of Regent Street, from Oxford Circus to Piccadilly Circus. If they had achieved only their first test of 12 sec, history would probably have denied them any honour: as they went on to fly for 59 sec the same morning, history rightly acclaims them. By September 1904 they were turning and making circuits, and flying for over five minutes at a time. By October 1905 they could bank, turn, circuit, make figures-of-eight—all with ease—and remain in the air for over half an hour at a time. It was not until November 1907 that the flight-time of 59 seconds was equalled by a European, and not until the winter of 1909 that it was equalled in England.

FORTY SHELL FILMS

A NEW catalogue of Shell loan films has recently been issued, and it is interesting to find, first, that the aviation section now lists 40 titles and, secondly, that the whole of the famous series of S.B.A.C. Show films is still available.

Newest film, in the technical series, is *Transonic Flight*. This starts with an analysis of the flow past an aerofoil between M. Crit and Mach 1.3, and goes on to define the subsonic, transonic and supersonic ranges and to study the difficulties and remedies.

Indicative, incidentally, of the wide field in which Shell have interests—and in case any aeronautical body would like a *real* change of subject for a film evening—are some of the other titles: *Raspberry Beetle, Breakneck Speeds at Goepang Trials, The Chairbodgers.*

The catalogue is available to representatives of organizations, who should write to Film Section, Public Relations Department, Shell Petroleum Co., Ltd., Kingsway, London, W.C.2.

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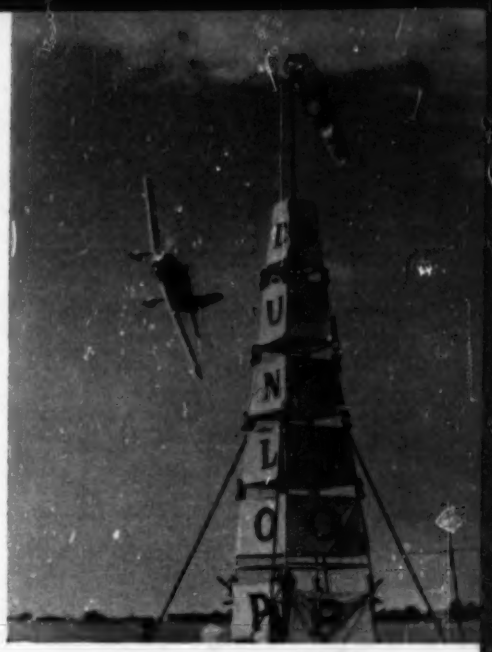
AIR RACING PAGEANT

Coventry Airport's Three Days of Aerobatics, Racing and Displays



The racing turn, demonstrated here by Brian Iles and the much-raced M.18.

BAGINTON 1958. Bright sunshine, blue skies, white clouds, torrential downpours, heat haze, mist and drizzle—Coventry's three-day air pageant last week-end experienced them all. The weather, in fact, overshadowed all other topics of conversation and in a shorter meeting might have wrought more havoc with the programme than it did; as it was the programme for Saturday, the final and most important day, was sadly depleted, although, after some doubts about the visibility, the King's Cup was run off to time.

The air races were less hampered by the weather than any other event, though to everyone's regret the finals of the aerobatic contest could not be held. But the Czech, French and Swiss finalists entertained Saturday's large crowds to a wonderful exhibition of demonstration aerobatics, the parachute contest was put on as scheduled and the Hunter, Jet Provost and Tiger Club teams achieved limited displays under a glowering 400ft cloudbase.

In the bright sunshine of Wednesday morning, competitors in the three class races, the Kemsley, Osram and Goodyear Trophies, started to re-learn the circuit used the previous year, and later, contestants in the aerobatic competition had a final practice of their intensive five-minute repertoires. The following day, the first round of the National Air Races was flown in the afternoon, and in the evening, for a neck-craning two hours, the aerobatics judges marked and commented on the performances of the 16 competitors for the Lockheed Trophy. Friday began with mist and very limited visibility, but by the afternoon the sky had cleared and very quickly six air races—the second and final rounds of the three class events—were run off in the sunshine.

THE CLASS RACES

Following the established pattern of the last few years, the entrants for the King's Cup—the grand prize of British air racing—are selected from the seven highest scorers in the three class races. This at once poses competitors with a thorny problem, since to win the King's Cup requires not only straightforward flying skill but some tactical skirmishing with the handicappers. If a little extra is still in reserve for the King's Cup, then chances are obviously so much brighter; but first it is necessary to qualify, and in doing so there are the three trophy races and the Air Racing Championship to be won. By the third round of the class races, speeds have usually been worked up to their peak; anything extra that is pulled out in the King's Cup is the result of a fortunate bonus acquired by further attention to the tune of engine and airframe and the slight rise in average speed that occurs over the longer course.

So, as always, the Nationals are lost and won on the ground as much as in the air. The amount of extra performance that can be found after three racing heats is obviously very limited—an extra polish perhaps (underneath, where the handicappers may not notice?) or a slight improvement to the fit of a cowling—but there certainly are ways of limiting speeds in the early rounds. Quite a good guide to what is going is the consistency of lap times; Brian Iles, who leaves little height to dive off at the finish of each race, remained consistent to within one second (0.3 per cent) per lap, while in the first round of the four-lap Kemsley Challenge trophy Appleyard improved between penultimate and final lap by over eight seconds. He had suffered some difficulty with his mixture control and was perturbed at his earlier loss in speed. The discrepancy was spotted of course, and he was penalized 21 sec in the first re-handicapping, although this was insufficient to prevent his winning the second round at a seven m.p.h. increase in speed, nor the third, at a further increase of half an m.p.h. to 148¼ m.p.h.

It is clearly noticeable that, particularly with the faster aircraft, the final dive over the finishing line and the straight run-through at the finish produces an appreciable reduction in lap time; with Peter Clifford's Mew Gull this amounted to 2.4 sec in the first two heats and over six seconds in the final heat, when he averaged 204 m.p.h.

As usual, the techniques and technicalities of the racing aircraft provided endless topics for discussion. Particularly noticeable is the effect of frontal and wetted area; small aircraft like the Mew Gull, the Speed Six, the Chilton, the Comper Swift (raced this year, incidentally, by David Ogilvy for the last time) and the Tipsy Belfair are all fast for their engine size. This is design aerodynamics, about which little can be done in pre-race preparation. But another factor that can be adjusted is acceleration, and a good deal of careful propeller selection was in evidence. Both Jackaroos, very much faster this year than last, wore metal propellers and so did most of the Geminis. Here, Blamire, whose aircraft is one of those that are exquisitely prepared—thin, highly polished bronze paint, chromed Dzus fasteners, no flap-position indicator, "eyebrow" strakes instead of slots, very carefully covered-over hand-

ILLUSTRATED WITH "FLIGHT" PHOTOGRAPHS

holds and footwells, beautifully fitting cowlings and covers—seemed much better suited than Dunkerley, whose propellers gave him a very poor initial acceleration. The result was that although he was only about five seconds slower than Blamire per flying lap, he lost between 22 and 25 seconds to him on each standing lap.

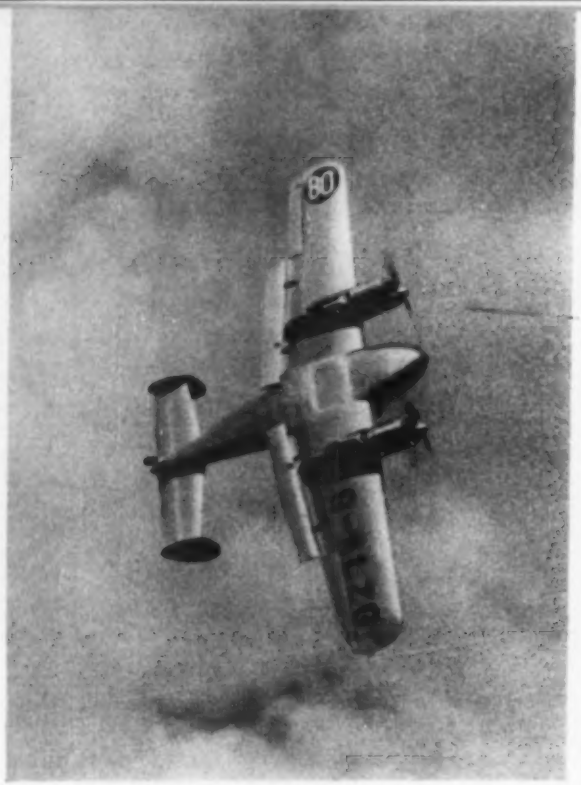
Just as much controversy as ever attends the best way to turn at the pylons, and by no means is the spectacular near-vertical bank the best technique for everyone. The opposing variables are the extra distance covered in a gentle turn or the speed lost in conforming to Mr. Newton's law of inertia, and it seems that where mass and speed are high a low rate turn may pay a dividend. Here again choice of propeller can play a part in providing better acceleration up to maximum speed. Elstree C.F.I. Bill Bailey's Hawk and David Ogilvy's Comper, for example, are almost comparable in maximum speed, although because of its superior turn and acceleration performance the Comper's Osram Cup race average was six m.p.h. higher—this in spite of an *initial* acceleration poorer to the extent of 40 sec on the standing lap.

In one-make racing, less of these many variables apply, but the variety of modifications devised is legion and, as the results showed, the handicappers had a harder time of it in the Goodyear Trophy event than in either the Kemsley or the Osram Cups.

Goodyear Trophy. Fourteen starters, flying Tiger Moths of every hue and every state of tune, were entered for this event. A minor difficulty was that although collectively the Tiger colourings would not have shamed Jacob's coat, the racing numbers under the wings were generally much too small to be properly seen as the aircraft took the aerodrome pylon turn, and it was impossible for the spectators in the enclosures to follow the interchange of positions without binoculars.

The excellent Tiger entry was strongly supported by the Tiger Club, whose efforts in recent months have brought them into popular demand wherever light aircraft are flown. In the first round, H. A. G. Smith's red and yellow G-AOXN led off with close rival Meynell 11 sec behind him. Denyer, whose blue G-AIVW is known to be a good deal faster than it looks (at least, on first sight; it is most carefully prepared) carried a handicap of 2 min 41 sec—too much for him to catch the leaders although he

Wise men of air racing: (left to right) Judge Mr. C. Audrey, Mr. C. M. Britland and handicappers Messrs. D. J. Lyons, W. J. Charnley and C. Audrey get down to it with slide-rules and pencils.



Percy Blamire's beautifully prepared Gipsy Major-Gemini 3C in a characteristic turn. He averaged over 170 m.p.h. in the Kemsley Trophy.

AIR RACING PAGEANT . . .

gained a few places. At the end of the third lap, Meynell passed Smith to win by three seconds. The second round was flown off the following day; Meynell elected to carry a passenger and so, in spite of his win of the afternoon before, he was awarded an 11 second improvement in his handicap. This proved to be an over-generous allowance, as his speed dropped by only ½ m.p.h. and he won comfortably from Reid and Smith, who were respectively 3.8 and 4.0 sec behind. This win put Meynell ahead of any other competitor in the Air Racing Championship, and assured him of winning it if he could finish in the first three in the final round. But this he just failed to do. Smith had improved his race average from 103½ to 104½ m.p.h. and then to 104⅔ m.p.h.; a piece of handicapmanship that gave him a 4.6 sec lead when he crossed the line on the last lap, and brought him level on points with Meynell. Behind Smith, Beverley Snook, Phillips and Meynell finished in a really tight close bunch, all within 0.4 sec of each other.

Eligible then for the King's Cup were Smith and Meynell, who would also be flying a private duel for the Air Racing Championship, Snook, Phillips, Pothecary and Donald. Denyer was lucky to get into the King's Cup race at all. Starting as back marker on each occasion, he had accumulated fewer points than Pothecary or Donald; but Pothecary had to drop out and Denyer became a King's Cup starter—a stroke of fortune of which he took full advantage.

Kemsley Challenge Trophy. Fastest race in the Nationals, the Kemsley Trophy attracted the best-known names in British Air Racing. A disappointment was the withdrawal of Dunkerley's Sparrowjet as the result of a temporary grounding of the Turboméca Palas engines; Dunkerley flew instead his dark blue Cirrus Minor powered Gemini, G-AKKB. There was a satisfactory lack of incident in the air races this year, although several competitors were beset with mechanical upsets which commanded between-race attention. W/C. McIntosh was unfortunate in the first round of the Kemsley to suffer a battery short in his recently acquired Proctor and he started nearly seven minutes late. But he gathered sufficient points in the second round, when he finished second, and in the third round, where he tied for second place with Barker's Proctor, to assure him a start in the King's Cup. Outstanding in all three rounds was Blamire, whose Gemini 3c (Gipsy Major 10 Mk 2 engines) averaged 169½, 170½ and 170¼ and was flown with considerable spirit. Appleyard's Chilton has also rarely gone better after a troubled first round, and he won the third round to share the Kemsley honours with Blamire. Iles in the M-18, Paine in the Hawk Speed Six and Peter Clifford in the Mew Gull (fastest aircraft taking part) were all good to watch but now seem to be too well weighed-up by the handicappers to be able to surprise them with an extra mile an hour or two of speed; only Ron Paine managed to qualify for the King's Cup.

Osram Cup. In a race meeting that would have produced few historical anachronisms had it been run by the Vintage Aeroplane Club, it was good to welcome two newcomers—the Turbulents flown by Norman Jones and G. F. Hancock and finished in white and bright blue, respectively. The first handicap anticipated a difference in performance, and gave Hancock's G-APBZ an eight second advantage, which he improved to 2.0 min 18 sec in the first round. Subsequently, they both started together as limit men, but in spite of the handicapper's disbelief, the blue Turbulent G-APBZ is substantially faster than G-APIZ; it averaged 89¼ m.p.h. to the latter's 83¼. Another surprise was the performance of the Jackaroos, immensely improved now that they are fitted with metal propellers. Heaton established an 18 sec lead in the first round and in spite of subsequent re-handicapping managed second place—and an extra 1½ m.p.h.—in the second round and fourth place in the third. He thus became runner-up to Smith and Meynell as Air Racing Champion and his performance did considerable credit to the Jackaroo.

The performance of C. A. Nepean-Bishop's Tiger 2 has been the subject of much speculation and he was fairly cautiously handicapped in each round; but he averaged 120½ m.p.h. and qualified for the King's Cup. This year, David Ogilvy, whose Comper Swift is a little slower than previously because of its wing-folding arrangement, did not manage to qualify; this combination will be sadly missed at future National Air Races.

The King's Cup. By Friday evening the last round of the class races had been flown and the stage was set for the King's Cup. Such last-minute preparations as there might have been were hampered by the weather. Dunkerley searched for a lost compression in the Alvis hangar and Barker checked plugs and points between the showers. Final polishing was impossible, since the misty rain had left every aircraft covered with a layer of water droplets—good weather for full throttle engine power perhaps, but otherwise decidedly unpleasant.

At 3.30 p.m., half an hour before the race was due to start, Ron Paine and Percy Blamire flew the latter's Gemini around the course to study the conditions. They were poor, and a postponement seemed likely. But the 21 starters moved down to the starting line, switched-off, and waited.

At 4 o'clock there was a slight improvement and a decision was taken to go ahead. Under the starter's flag were the two Jackaroos as limit men, five Tiger Moths separated on handicap by 36 sec, Westoby's Auster 5 J1, Phillips' Tiger Moth (rather badly placed on previous performance), Hill's Tipsy, Denyer, "the Bishop," a Hawk, a Monarch, a Chilton, three Proctors, a Cirrus Gemini, a Gipsy Gemini and, nearly 19 minutes behind the first Jackaroo, the Hawk Speed Six.

Hartas' Jackaroo, the first aircraft to take off under the ominous black clouds, reached the scatter point, turned steeply and disappeared down-wind. With four laps to be flown over a total distance of about 70 miles by aircraft of enormously varying speeds, the start was a protracted affair. One by one throttles were pushed forward, brakes were tripped off, tails brought quickly up and the aircraft accelerated away. The first Jackaroo had completed a lap and rounded the pylon at the aerodrome turn before Bowles got his Monarch away. Then Heaton—not apparently having caught up very much on Hartas—took the turn, corrected his course and continued his chase. Westoby and Phillips were close at the first turn, and as they went by McIntosh and Appleyard took off together, the latter dropping back slightly as he caught the Proctor's slipstream. Bowles took the aerodrome pylon fast as Paine took off in the Speed Six.

As he did so, for a few minutes the sun struggled through the

King's Cup congratulations from W/C. McIntosh (right, second place) to J. H. Denyer, who also won in 1956. W. H. Bailey (left) was third in a Hawk 3, standard except for high-compression pistons.

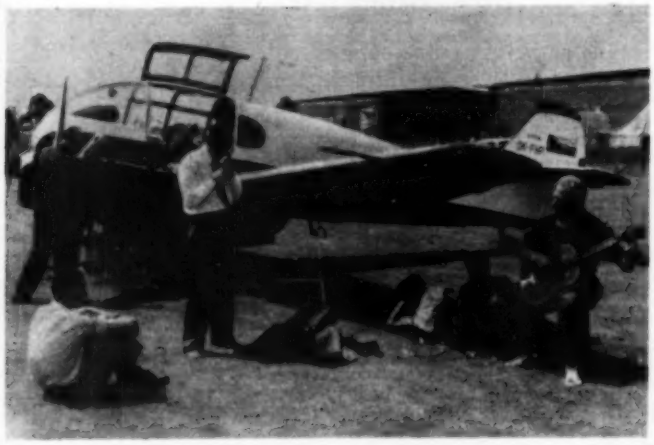
THE KING'S CUP

Place	Pilot	Aircraft	H'cap m. s.	Speed m.p.h.
1	J. H. Denyer	Tiger Moth	05 12	118¼
2	W/C R. H. McIntosh	Proctor	13 04	152
3	W. H. Bailey	Hawk Trainer 3	07 59	128
4	C. A. Nepean Bishop	Tiger Moth 2	06 26	121¼
5	R. R. Paine*	Hawk Speed 6	18 56	191¼
6	J. Heaton	Thruxton Jackaroo	00 57	105
7	T. G. Knox	Proctor 3	13 25	152¼
8	J. E. G. Appleyard	Chilton D.W. 1a	13 06	151
9	D. Westoby	Auster 5 J.1	03 14	111¼
10	D. Hartas	Thruxton Jackaroo	00 00	102¼
11	A. Barker	Proctor 3	14 05	156¼
12	J. M. Donald	Tiger Moth	02 14	108¼
13	W. P. Bowles	Miles Monarch	10 49	139
14	M. H. Reid	Tiger Moth	02 18	108¼
15	B. J. Snook	Tiger Moth	03 19	110¼
16	D. W. Phillips	Tiger Moth	03 14	110¼
17	F. Dunkerley	Gemini 1a	15 52	166
18	H. A. G. Smith	Tiger Moth	01 42	106¼
19	W. P. Meynell	Tiger Moth	02 03	107
20	P. Blamire	Gemini 1a	16 41	167¼
21	J. Hill	Tipsy Belfair	04 03	111

* Winner of S.B.A.C. Cup for best speed over course.

clouds. McIntosh completed his first lap, having pulled away slightly from Appleyard. Blamire came through and then, travelling very fast, Paine's Speed Six, hot on the Gemini's heels. Lap by lap the field closed up until the last man had passed the aerodrome pylon for the third time. There was a long pause that commentator Alan Brothers described, tongue in cheek, as "an exciting race, with nothing in sight!" Eyes strained toward the aerodrome boundary. And then, the deluge. Diving towards the finishing line, gathering the last ounce of possible speed, were Bailey, Denyer, McIntosh, Nepean Bishop, Paine's Speed Six gaining places rapidly in the last ½ mile, Heaton and Knox and the rest of the field. A fine finish to the 1958 King's Cup, with Denyer just in the lead from McIntosh by 1.7 seconds, and Bailey 1.6 seconds behind. Meynell and Smith fought for the Air Racing championship right to the finishing line, with Smith the victor by 2.8 seconds—as close-run a contest as any handicapper could hope to see.

Maintenance of the port engine of this Aero 45 had a musical accompaniment from the Czech team. The aerobatic entrants gave the Pageant a Continental atmosphere.



PARACHUTING AND AEROBATICS

The British Parachute Club held the eliminating contest to decide on the team of four which should represent Britain at the forthcoming parachuting championships to be held in Czechoslovakia. The low cloud base restricted competition to a single target jump with immediate opening from a Tiger Moth at 1,500ft for each competitor. Sue Burges won with a landing 42ft from the target. The remaining results were Sgt. J. McLoughlin, R.A.F., 93ft; Sgt. D. Lee, R.A.F., 118ft; M. Reilly, 218ft; and G. Bottomer, 255ft. M. Richard landed outside the target area.

The British Lockheed Trophy International Aerobatic Competition was to be flown in two rounds, but, since the weather washed out the final, the placings were decided from the original marking of the seven pilots chosen to go forward to the finals. The team prize went to the Frenchmen. The panel of judges consisted of Hubert Broad, Oliver Stewart, Geoffrey Tyson, Jeffrey Quill and Charles Turner-Hughes, all test pilots in their time.

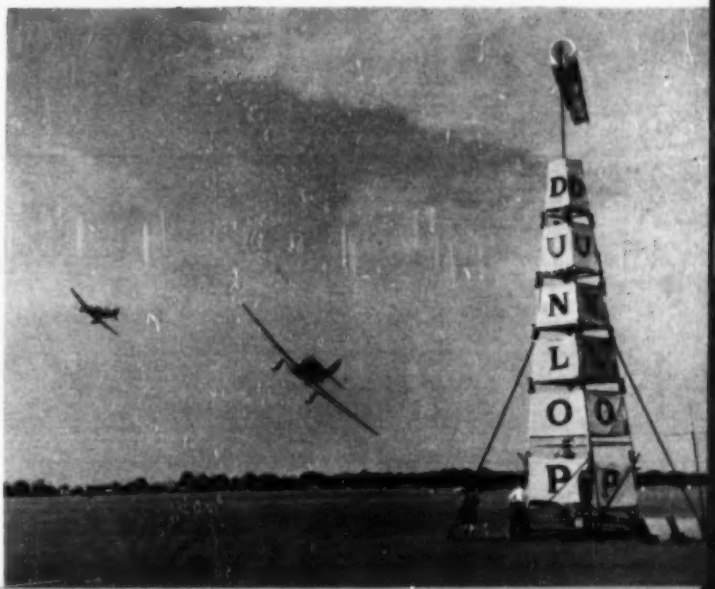
Heaton urges on his Jackaroo to good effect; he won the Osram Cup. Fairey propellers increased the Jackaroo's speed by about 5 m.p.h.

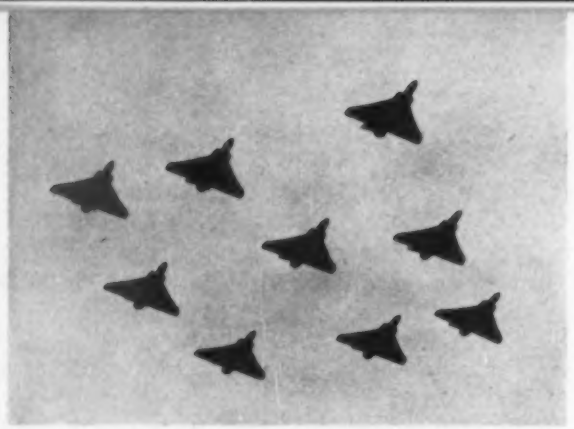
THE BRITISH AIR-RACING CHAMPIONSHIP

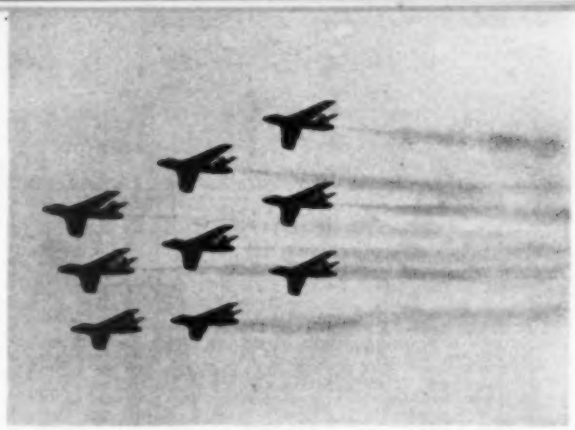
Final Place	Pilot	Aircraft	Round One	Round Two	Round Three	Best Speed m.p.h.	Cham. Points
Kemsley Challenge Trophy							
1	J. E. G. Appleyard	Chilton D.W. 1a	6	1	1	148¼	80
1	P. Blamire	Gemini 3c	1	3	4	170¼	80
3	A. Barker	Proctor 3	3	6	2 tie	153½	74
4	R. R. Paine	Hawk Speed 6	4	5	5	187¼	68
5	T. G. Knox	Proctor 3	5	4	7	150	64
6	W/C McIntosh	Proctor 3	13	2	2 tie	149	62
7	F. Dunkerley	Gemini 1a	2	7	9	163¼	60
8	P. S. Clifford†	Mew Gull	10	9	6	203¼	46
9	G. Marler	Falcon 6	8	8	10	169¼	44
10	E. Crabtree	Gemini 3c	7	12	11	168¼	36
	H. B. Iles	M. 18/2	11	11	8	139	36
12	A. J. Spiller	Proctor 3	9	10	12	142¼	34
13	A. S. K. Paine	Proctor 1	12	13	13	153	20
Osram Cup							
1	J. Heaton	Jackaroo	1	2	4	104¼	82
2	W. P. Bowles**	Monarch	2	6	3	136½	74
3	J. Hill	Tipsy Belfair	10	1	1	109½	72
4	D. Hartas	Jackaroo	3	4	3	101¼	66
5	C. A. N. Bishop	Tiger Moth 2	4	7	6	120½	62
6	W. H. Bailey	Hawk Trainer 3	7	9	2	125	60
6	D. Westoby	Auster 5 J.1	8	3	7	109¼	60
8	A. G. Hancock	Turbulent	6	8	5	89¼	58
8	D. F. Ogilvy	Comper Swift	5	5	9	127¼	58
10	C. E. Elton	Hornet Moth	9	10	10	111	38
11	B. Maile	Aeronca Champ.	11	11	11	88¼	30
12	N. H. Jones	Turbulent	12	12	12	83¼	24
Goodyear Challenge Trophy							
1	H. A. G. Smith*	Tiger Moth	2	3	1	104¼	84
1	W. P. Meynell	Tiger Moth	1	1	4	106½	84
3	M. H. Reid	Tiger Moth	5	2	5	106¼	72
4	B. J. Snook	Tiger Moth	7	4	2	109½	70
5	Cpt. D. W. Phillips	Tiger Moth	6	7	3	108¼	64
5	J. Pothecary	Tiger Moth	4	6	6	108½	64
7	J. M. Donald	Tiger Moth	3	5	10	107	60
8	J. H. Denyer††	Tiger Moth	10	9	8	116	42
9	A. G. Oldham	Tiger Moth	11	10	7	114½	40
10	G. T. Francis	Tiger Moth	8	8	14	108¼	36
11	W. V. Fitzmaurice	Tiger Moth	9	11	11	105½	34
12	C. Boddington	Tiger Moth	13	12	9	107½	28
13	J. A. Wardley	Tiger Moth	12	13	12	103¼	22
14	J. Piercy	Tiger Moth	14	14	13	105½	14

* British Air Racing champion. † Air League Challenge Trophy (best average speed 202 m.p.h.).** Norton-Griffiths Challenge Trophy (best average speed, 136 m.p.h.). †† Grosvenor Challenge Trophy (best average speed, 116 m.p.h.).

Starting together in round three of the Kemsley, McIntosh (Proctor) and Appleyard (Chilton) had a race long duel. McIntosh won by 1.8 secs.







Nine Javelins from Nos. 23 and 41 Sqns. fly over in the murk, left, before the Hunters of No. 111 Sqn., right, gave a restricted formation display.

AIR RACING PAGEANT . . .

They took into account showmanship as well as flying skill and originality of manœuvre; and they remarked afterwards that the skill of the pilots and the qualities of their aircraft were such that the displays tended to become exhibitions of aerobatics rather than aerobatics. Léon Biancotto, the winner, later suggested that a prescribed sequence of classic manœuvres might be added as a separate part of the competition, possibly performed in a standard type of aircraft. The final placings were, 1st, Biancotto; 2nd, Z. Beseda; 3rd, Chevalier d'Orgeix; 4th, V. Krysta; 5th, F. Liardon; and 6th equal, G. Verette and J. Hulka. Their aircraft and nationalities are noted below.

British aspirations for at least a modest success in the British Lockheed Trophy international aerobatic competition were higher this year than have been dared before. British competitors have in "The Bishop" a machine with an inverted-flying system and, notwithstanding its aerobatic limitations C. Nepean Bishop's G-APDZ—flown by all the British entry but Barry Radley—is the best for the purpose yet devised. But the Bishop lacks the power of the Treners, the fast roll of the Jungmeister and the powerful ailerons of the Stampes. Yet a private demonstration by Biancotto in this aircraft on Friday indicated what can be done with really skilled flying.

Though lacking long hours of practice and intensive schooling, the British entry showed more than embryo skill. Against less stern opposition than that of Krysta and Biancotto, Hulka or Liardon, some of the performances put up by the Tiger Club—very noticeably that of Nepean Bishop himself—would do more than justice to less hotly contested events. As it is, variety and positioning seem in general to be rather weaker than their skill in execution.

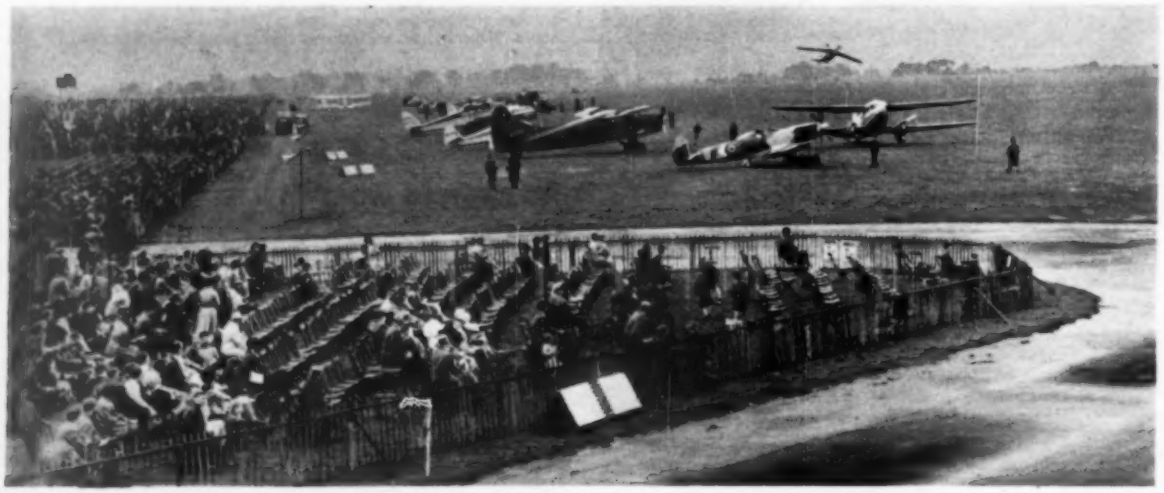
Through cancellations, the entry list for the Lockheed Trophy this year lacked the redoubtable Czechs Blaha, Krenc and Prikryl who were reputed to be performing in Moscow. The sixteen competitors in the eliminating trials were, in the order of flying: L. Biancotto (Zlin Trener, France), C. A. Nepean Bishop ("Bishop," Britain), V. Krysta (Zlin Akrobat, Czechoslovakia), F. Liardon (Jungmeister, Switzerland), Le Chevalier D'Orgeix (Stampe SV4, France), G. F. Hancock ("Bishop," Britain), J. Hulka (Zlin Trener, Czechoslovakia), C. Boddington ("Bishop," Britain), G. Verette (Stampe SV4, France), B. Radley (Chipmunk, Britain), D. M. Hartas ("Bishop," Britain), Z. Beseda (Zlin Trener, Czechoslovakia), P. J. Langstone ("Bishop," Britain), M. Charollais (Stampe SV4, France), A. H. F. Guillou (Stampe SV4, France), Capt. D. W. Phillips ("Bishop," Britain).

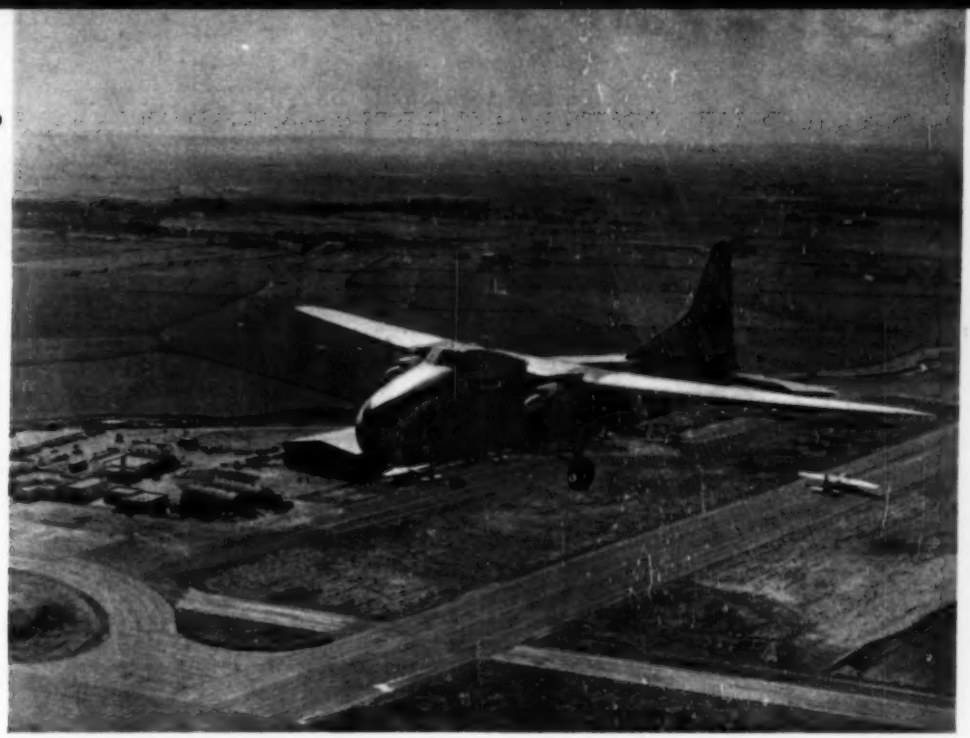
THE AIR DISPLAY

Weather did its level best to wash the display out, but could not quite make it. Nevertheless, a very low cloud base did confine all the demonstrators to a level performance and, during a number of items, a Hunter from No. 111 Sqn. was to be seen flitting amongst the cloud patches to assess the possibility of making any appearance at all with the nine-man team. When the Hunters did arrive, the commentator observed that the cloud-base was 400ft and that the formation spanned 300 of those feet—not conducive even to steep turns, let alone loops and rolls. An immaculate diamond of nine did fly past, streaming smoke; and the "inner" team of five then showed various of their formations, wings shimmering with vapour. A pack of nine Javelins from Nos. 23 and 41 Sqns. and a Valiant flew past; de Havilland's demonstrator Otter was flown by S/L. J. H. Lewis, C.O. of the R.A.F. detachment, Trans-Antarctic Expedition; a Super Aero manœuvred with one propeller feathered; two sticks of four army parachutists jumped from a captive balloon; a Coventry Gliding Club machine was towed at low level past the enclosures before casting off for an aerobatic display; a team of three Tiger Club Tigers, tied together, flew in formation and landed with one of the connecting tapes broken.

A Hunting Jet Provost T.2 managed a spirited and graceful display of turns and rolls including a pretty four-point hesitation roll and a roll from the inverted position. Later, the C.F.S. team of four Jet Provost T.1s, painted red and white, showed some very close flying in line astern, box and cross formation. Despite restricting conditions, F/L. R. Holloway of C.F.S. put up a fine show in a Vampire T.11. He was this year's winner of the Wright Jubilee Trophy, competed for each year by instructors at R.A.F. jet training schools. He managed a loop in a slight gap in cloud, extended his wheels at the top of a roll off the top and performed several rolls with the undercarriage still down. He departed suddenly and vertically into cloud. A. T. P. and C. M. L.

One of the Zlin Treners passes inverted along the line of aerobatic and demonstrating aircraft during an extra-curricular exhibition on Saturday afternoon. The Otter demonstrator and an R.A.F. Spitfire are nearest the camera.





A Silver City Bristol Freighter Mk 32 over Ferryfield. "Flight" photograph

Silver City Decade

Ten Years of Vehicle Ferry Operations

BY JOHN STROUD

TEN years ago last Monday, on July 14, 1948, the Bristol 170 Freighter G-AGVC took off from Lympne bound for Le Touquet. The aircraft was owned by the Bristol Aeroplane Company, from whom it was borrowed by Silver City Airways, and it carried in its hold the first car to be flown commercially across the English Channel.

This was the beginning of a unique air transport operation which has grown steadily into a system of over-water ferries that in ten years have made 125,000 flights carrying 215,000 cars, 70,000 cycles and motor cycles and 759,000 passengers. It was with just cause, therefore, that Silver City Airways held 10th anniversary celebrations at Ferryfield and Le Touquet last Monday. At each airport one of the Bristol Freighters was named *The 14th of July* in both French and English.

The company, part of the British Aviation Services group, has proved right in foreseeing a good future for the operation of an aerial vehicle ferry; but in the beginning it needed much enthusiasm and a lot of confidence to embark on such a project, remembering the difficulties of that period, which included restrictions on travel caused by tight currency control. There was, of course, a strong desire in people to get out of Britain for holidays after the war but little indication that overseas travel would develop to its present extent.

During 1948 Silver City Airways operated on a charter basis; indeed it would have been illegal to operate a scheduled service, but between July and September that year 170 cars were carried together with 350 passengers and an additional 13 tons of freight. The charge for carrying a small- or medium-sized car not more than 14ft long was £27 one way. The rate for a large car was £32. These rates included the carriage of up to four of a car's occupants.

Silver City considered that the first season's operations justified the re-opening of the "service" in 1949, and a Government licence was granted for scheduled operations during that year. Three hired Bristol 170s were employed, and with the 1948 rates still applying the 1949 traffic totalled 2,600 cars, 100 motor cycles, 7,900 passengers, and 250 tons of freight additional to the tonnage of vehicles. In 1948 Silver City had made 104 flights and in 1949 there were nearly 1,700.

Towards the end of 1949 the company was granted a new licence covering operations in 1950 and 1951. In the peak season of 1950 the schedules called for four flights a day each way, but by the summer of 1951 services were scheduled for every half-hour from 0800 until 1800 out of Lympne and from 0900 until 1900 out of Le Touquet.

Rates were reduced and in 1951 the one way charges were: £16 for a car not more than 12ft 6in long, £20 for up to 15ft 6in, and £24 for cars more than 15ft 6in long. Passengers were charged separately at £2 each.

The 1950 figures were 3,253 cars, 639 motor cycles, 127 cycles, 10,800 passengers and 329 additional tons of freight. With the lower rates and wider public knowledge of the service the 1951 figures rose by a considerable amount to produce 7,529 cars, 3,240 motor cycles, 1,355 cycles, 30,137 passengers, and 829 additional freight tons. Eight aircraft were employed at peak week-ends during 1951, and during the winter 1951/52, for the first time, the service continued in operation. During the winter the vehicle traffic was supplemented by the carriage of about 2,000 cattle.

The establishment of the vehicle ferry service had proved successful but its future development and the provision of new equipment was a hazardous venture unless the company could obtain greater security for its operating rights. Such security was obtained in 1951 when the Government granted a 10-year operating licence for the Lympne - Le Touquet route. This was the first long-term licence granted to a British independent airline.

In 1951 the ferry was working at high pressure and it was decided that in the next year two additional routes would be opened, Lympne - Ostend and Southampton - Cherbourg. Although both these routes are still operated, about 90 per cent of all traffic is carried on the shortest route to Le Touquet and to the Calais terminal which was introduced later.

Although plans were made for the carriage of record traffic in 1952 this traffic did not materialize. The foreign travel allowance was cut by the British Government from £100 to £25 and the effect was shown by the year's traffic totals of 6,895 cars, 2,203 motor cycles and 28,836 passengers. The number of cycles, however, rose to 1,842—this was not inconsistent with the cut in travel allowance. In 1952, for the first time, vehicle rates included comprehensive insurance coverage against loss or damage. Fares and rates were also reduced further.

Nineteen fifty-three saw much development including the introduction of a fleet of six Bristol 170 Mk 32 aircraft of increased

(Continued on p. 82, after double page of Silver City pictures)

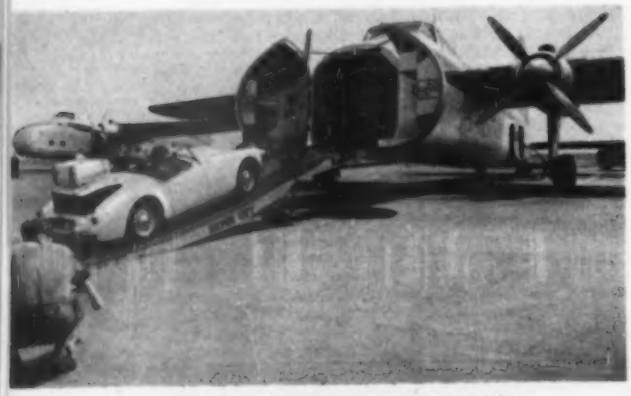
1 This sequence, photographed at Silver City's airport at Ferryfield, illustrates the whole departure operation of the cross-Channel service. Leaving their cars, passengers check in . . .

2 A short wait in the passenger lounge provides an opportunity to study the airline's Douglas DC-3s and Bristol Freighter Mk 31s and 32s at work . . .

Silver City Decade

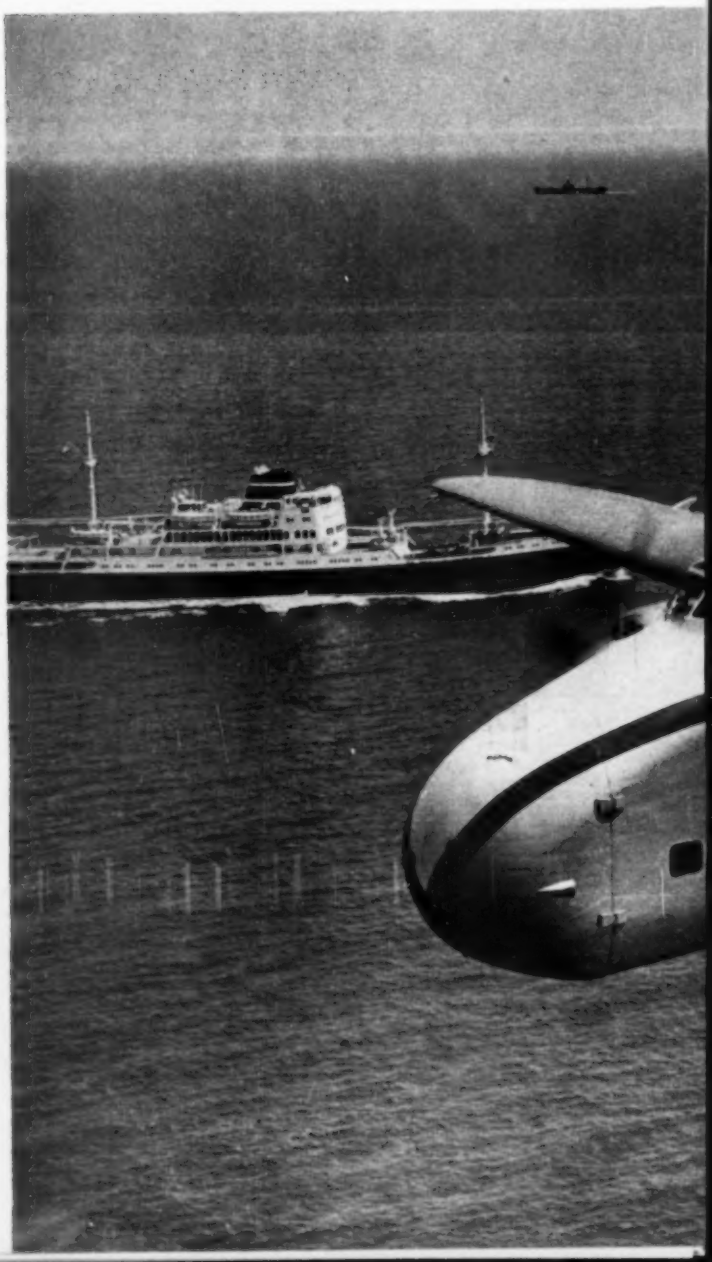
Departure Sequence

5 and 6 Walking out to their aircraft, travellers at any time of day may see a load of freight destined, like their cars (below), for the cavernous jaws of a Freighter . . .



7 And soon, Le Touquet bound, as depicted on the right, they are passing the time of day with Channel shipping.

"Flight" photographs



3 Passports are examined, cars are checked under cover, and driven out to the aircraft by airline personnel while drivers and passengers look on . . .

4 Arriving from Le Touquet, 15 minutes before the return flight, is the aircraft which will carry three cars and the waiting passengers to France . . .

A typically busy morning at Ferryfield.

Silver City Decade . . .

capacity, able to carry three cars and 15 passengers. Another reduction in fares and rates, averaging a cut of 28 per cent, made the air ferry competitive with surface transport for the first time.

At peak periods the Lympne - Le Touquet service was operated every 15 minutes between 0715 and 2015, the Ostend service was scheduled to fly every two hours from 0800 until 1600, and the Southampton - Cherbourg schedule was once every 75 minutes from 0800 until 1645. An hourly Southampton - Bembridge service and a twice daily Gatwick - Le Touquet service appeared in the company's timetables.

At the busiest periods the Bristol Freighters made up to 170 Channel crossings a day, and the year's figures came to 39,000 vehicles and 96,600 passengers. During August alone Silver City carried more vehicles than it had previously carried in any complete year. It was also in 1953 that the company experimented with the double-deck Bréguet Deux-Ponts, but this was never used on cross-Channel operations.

Nineteen fifty-four was an even bigger year in the company's affairs and included a change in the airline's control which in February passed to the General Steam Navigation Co., a subsidiary of the Peninsular and Oriental Steam Navigation.

From the inception of operations, Silver City's vehicle ferries had used Lympne Airport as their U.K. base. Lympne was chosen because it was the nearest airport to the French coast and it was rightly decided that the air journey must be as short as possible. However, Lympne had a number of disadvantages. It had no hard-surface runways, and its height above sea level caused interruption of services in bad weather, when the cloud often came right down on to nearby trees. Also, by 1953, it was obvious that the airport was not capable of handling the growing traffic.

Silver City therefore undertook the bold step of producing its own new airport at a cost of £500,000. A site on the flats near Lydd was chosen and Richard Costain, Ltd., distinguished themselves by designing and building the new airport—known as Ferryfield—in six months. Two runways of 4,050 and 3,500ft were constructed as well as a terminal building and control tower, and by the end of July 1954 the new airport was in full operation. Since that time it has been further extended and improved. It is operated by Ferry Airports, Ltd., a Britavia subsidiary, and the costs to Silver City are less than if the company were using an airport owned and operated by the M.T.C.A. Its aids include Decca 424 radar, and subsequently similar equipment has been installed at Le Touquet.

Routes operated in 1954 were as in 1953 except that there were no scheduled services to Bembridge, but a new route between Lympne and Calais was opened with a half-hourly frequency from 0800 to 1630. For a short time a weekly Blackbushe - Zürich service was operated.

Three more Mk 32 aircraft were acquired, thus making a fleet of 15 Bristol aircraft, and fares and rates were cut again—for the fifth consecutive year. Traffic in 1954 totalled 42,507 vehicles (30,966 cars and 11,541 cycles and motor cycles) and 112,214 passengers. More than 18,000 vehicle ferry flights were completed and in one day 222 Channel crossings were made. During the year a further 15,000 passengers and 4,500 tons of freight were flown on charter operations. Each of the company's aircraft averaged 2,970 take-offs and landings.

In 1955 Silver City added new vehicle ferry routes to its system although some of these were comparatively short-lived. On April 6 a thrice-daily service was opened between Stranraer and Belfast and a daily service between Southampton and Deauville. On June 17 a Liverpool (Woodvale) - Belfast service came into operation.

In spite of a 15 per cent increase in I.A.T.A. members' fares in March, Silver City Airways still did not raise its rates; in fact some reductions were again made. These took the form of a 10 per cent reduction in car rates on mid-week services and a reduction in the cost for carrying a cycle between Lydd and Calais or Le Touquet from 5s to 2s 6d. That year the ferry traffic came to 57,101 vehicles including 42,589 cars, and 166,219 passengers; 22,315 Channel crossings were made and there were 246 on one day.

In 1955 the Cumberbatch Trophy was awarded to Silver City Airways "for magnificent work on the cross-Channel air ferries." In nearly eight years of operation the company had made more than 60,000 flights without injuring a passenger.

At the year's end Mr. Eoin Mekie, the company's chairman, said that the 1955 fares had been quite uneconomic and that reluctantly it had been decided to make increases of about 15 per cent.

These increased fares and rates applying in 1956 were most likely responsible for that year's reduced traffic, which produced 44,848 vehicles, of which 33,191 were cars, and 125,243 passengers. Nevertheless, freight traffic increased to 14,645 tons. Five new Bristol 170 Mk 32 aircraft were added to the fleet during the year.

Although in general Silver City's rates were increased in 1956, the company introduced new services providing cheap travel between London and Paris and London and Belgium for non-motorists. These were the *Silver Arrow* coach/air/rail operations, begun in May that year. (*contd. on p. 83*)

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LONG RANGE BALLISTIC MISSILE

In the Defence White Paper published this year, it was announced that Great Britain was engaged in the design and development of 'a most advanced type' of ballistic missile. de Havilland Propellers Limited is the overall design authority for that work and invite applications for the following senior engineers:

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Silver City Decade . . .

On the London - Paris route, worked in association with Cie. Air Transport, passengers travel by coach from Victoria Coach Station to Lydd, then fly to Le Touquet, and continue their journey to Paris by rail-car from Etaples to Gare du Nord. The fares charged originally were £4 5s single and £8 10s return. Between London and Brussels, passengers used coaches at each end and flew the Lydd - Ostend sector. A new service was also opened in 1956 between Southampton and Guernsey.

Last year Silver City cut its fares again and there was a slight increase in vehicle traffic with 34,361 cars being carried; but the passenger figure was only 117,178.

This year Silver City has cut rates by as much as 50 per cent and bookings have almost doubled. Estimates show traffic totals for this year at 60,000 to 65,000 cars and 200,000 to 250,000 passengers on ferry services. A similar number of passengers are anticipated on the company's inclusive tour operations.

The fleet of Bristol 170s now comprises 14 Mk 32 aircraft, of which 12 are used on the ferry services, and eight Mk 31s. All the Mk 31s and two of the Mk 32s are all-passenger aeroplanes.

It is interesting to note that the current year's vehicle traffic will be carried with 12 aircraft whereas 20 aircraft were used to transport 57,000 in 1955. This is made possible by more efficient working and much improved booking methods.

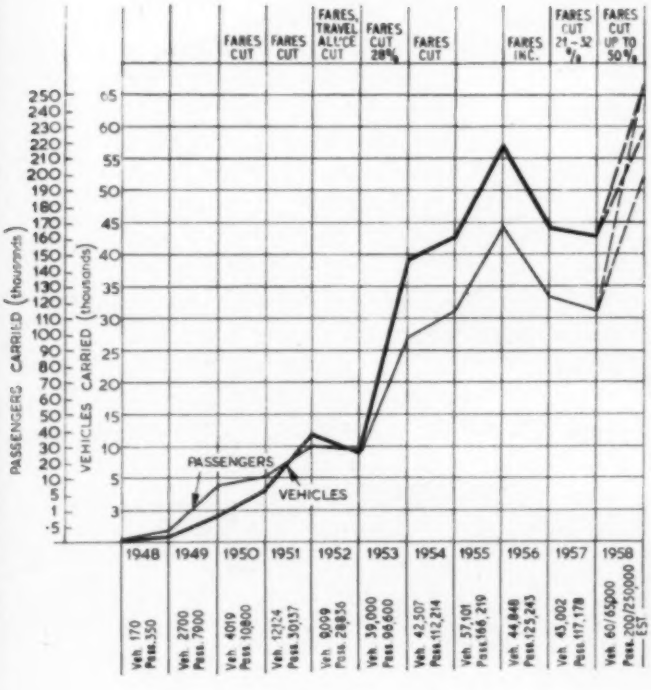
It is very difficult to arrive at any one factor as being responsible for the success of the vehicle ferries. The foresight (largely of A. Cdre. G. J. Powell, until recently the company's managing director) in starting the service obviously met a demand. The conditions for such operation are almost perfect geographically and from the point of view of traffic potential it is indeed difficult to find a counterpart anywhere else in the world. In addition, the company's publicity, sales effort and press relations have been excellent, and the safety record has undoubtedly helped to build up traffic.

A policy of low fares has played a big part in increasing traffic but fares and traffic cannot be taken as being absolutely related. Fluctuations in holiday travel allowance play their part, and it is to be noticed that political disturbances, even in remote parts of the world, tend to make some people afraid of crossing the Channel.

Aircraft utilization is low, at about 1,100 hr a year, but must remain so on such short stage operations. Full power is used more frequently than on any other type of airline operation and, of course, undercarriage and tyres are subject to more frequent loadings. On the other hand, the aircraft do far less flying between major overhauls.

The staff of the company is fairly small and there is no doubt that costs are kept down by its enthusiasm and hard work. Load factors overall are good and winter traffic has built up recently. Freight is increasing rapidly and there is less of a winter trough than in earlier years.

Table illustrating Silver City Airways' passenger and vehicle traffic for the past ten years, with estimated figures for 1958.



Journey's end: one of Silver City's Mk 32 Bristol Freighters coming in to land after yet another Channel crossing.

No new cross-Channel routes are planned and it appears that the shortest crossings, to Le Touquet and Calais, will go on producing a very large percentage of the overall traffic although the Ostend and Cherbourg loads are increasing steadily—as a result, it is thought, of lower fares.

On existing routes Silver City believes it will continue to get an increasing percentage of all cross-Channel vehicle traffic. Last year the company carried one out of seven cars crossing to the Continent; this year they expect to carry a quarter of the total traffic; and within five years they expect to carry 50 per cent. Air carriage of cars is increasing at a much greater rate than surface carriage. The company visualizes a great increase in freight and believes that its Roadair co-ordinated freight services to and from the Continent could become as large an operation as its vehicle ferries.

Regular scheduled operations for Roadair began in 1956. By this system road haulage is used between factories in the U.K. and Lydd and again between the Continental airport and the cargo's destination. A very wide range of products is being lifted and the company now talks about freight in 50- to 100-ton consignments.

Delivery of new cars has become a regular source of traffic and Silver City is considering the purchase of a vehicle transporter to provide through car delivery from any factory in this country to any destination in Europe. This Roadair delivery system is saving time and money, the insurance rates are very low (from 6d to 1s 6d per £100 value depending on commodity) and users have been very gratified by the low damage rate, which applies particularly to cars.

For all its operations the Bristol 170 has proved a most useful aeroplane for Silver City's purpose and there are no plans for its replacement by larger or faster aircraft. It has indeed been suggested that the Bristols might put in as much as 30 years' service on the ferry routes.

It is not desirable that a greater number of vehicles should be carried in one aircraft. An increase from three cars to, say, six or eight would reduce the passengers' impression of personal service, and increase loading and unloading times, entailing consequent earlier passenger reporting; and an aircraft of greater capacity would still be difficult, if not impossible, to fill in the winter.

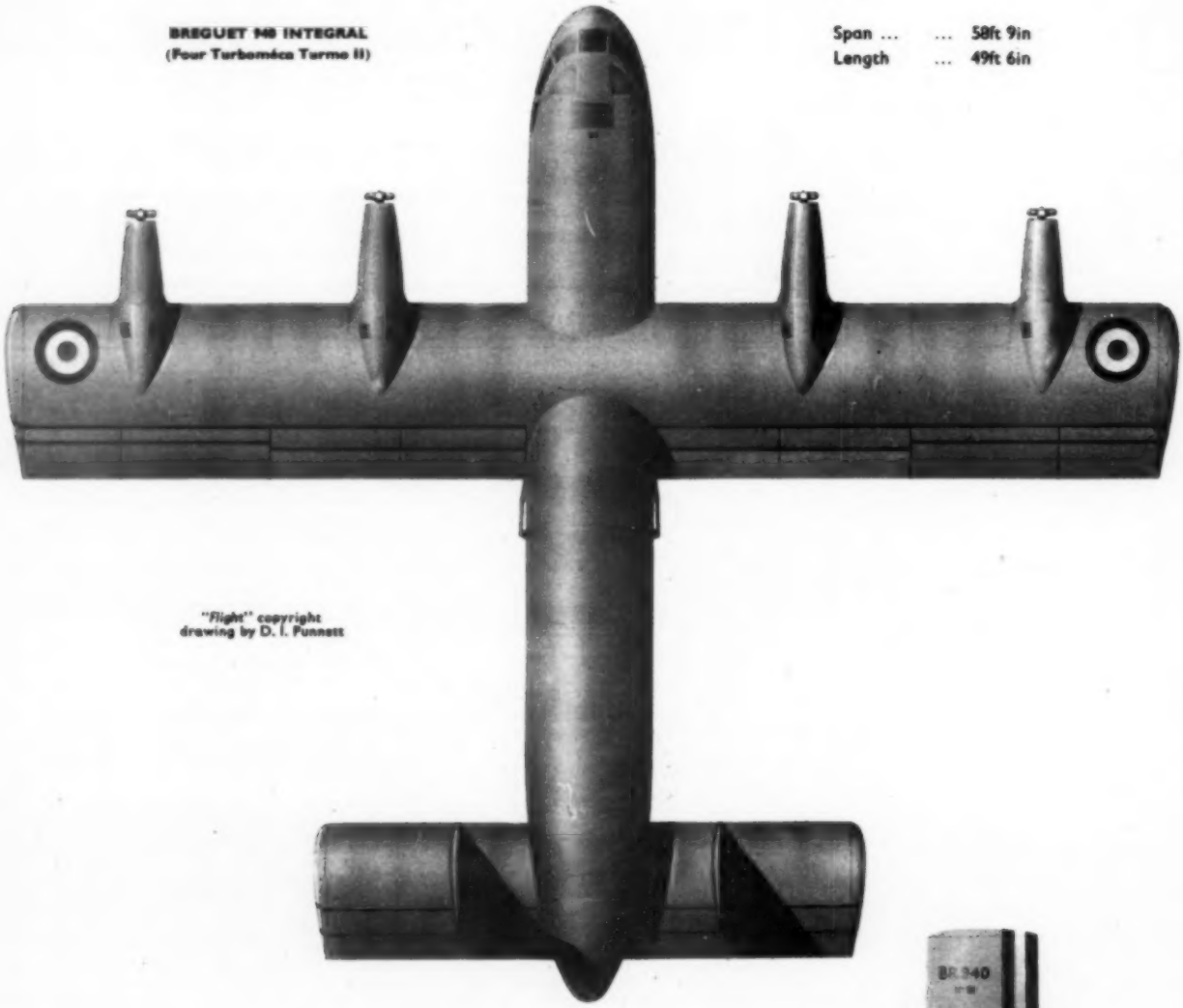
The Fairey Rotodyne is of interest to Silver City Airways, who obtained, in 1954, a 10-year licence for the operation of helicopters on its cross-Channel routes. It would be several years before this type could come into operation, but it is attractive because it has similar capacity to the Bristol 170 Mk 32 and would probably be capable of quicker turn-round and also of operating under more adverse weather conditions. The Rotodynes would, like the Bristols, use Decca as a route aid.

As in the past the rates for vehicles on the cross-Channel services vary according to the season and to the part of the week, but this year the cheapest fares apply to a bigger percentage of the services. During the peak season (June 1-September 30) the following specimen rates apply. They are shown here with standard fares first and peak week-end fares in brackets. They are single journey fares for the Lydd - Le Touquet and Lydd - Calais routes: —

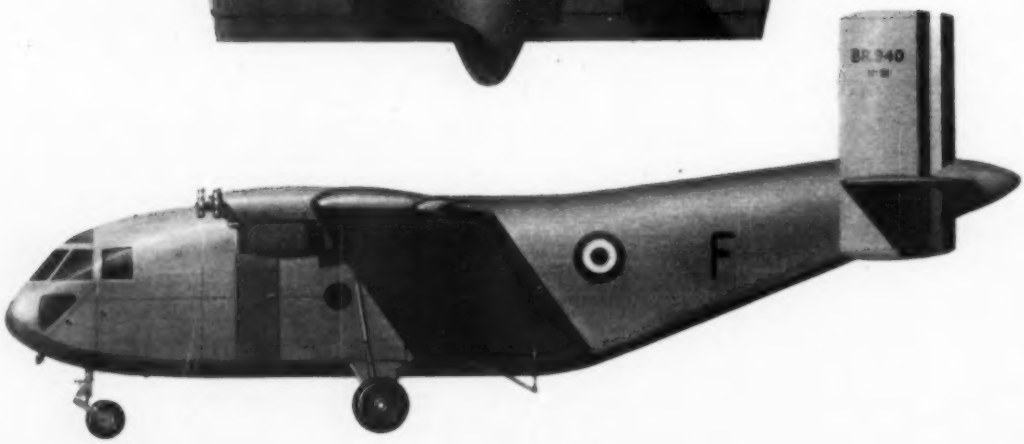
Tricars and cars not exceeding 11ft, £4 10s (£6); cars not exceeding 12ft, £5 10s (£7); 12ft 6in, £6 10s (£8); 14ft, £9 10s (£11 10s.). Motor cycles up to 250 c.c., £1 (£2). Cycles, 2s 6d. Passenger fares are £3. (Rates are quoted for car variations of each 6in from 12ft to 16ft 6in.)

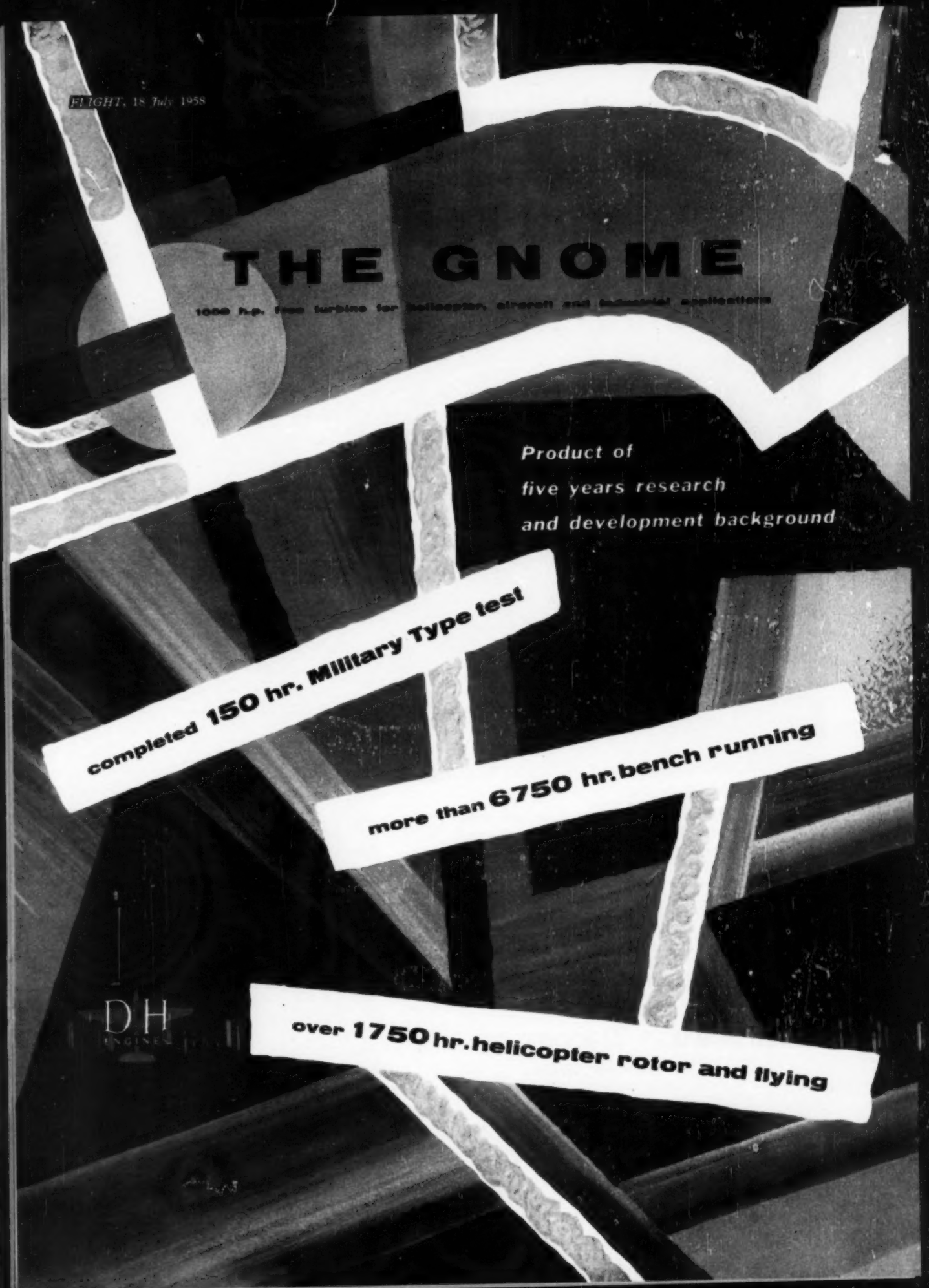
BREGUET 940 INTEGRAL
(Four Turbomeca Turmo II)

Span 58ft 9in
Length ... 49ft 6in



"Flight" copyright drawing by D. I. Punnett

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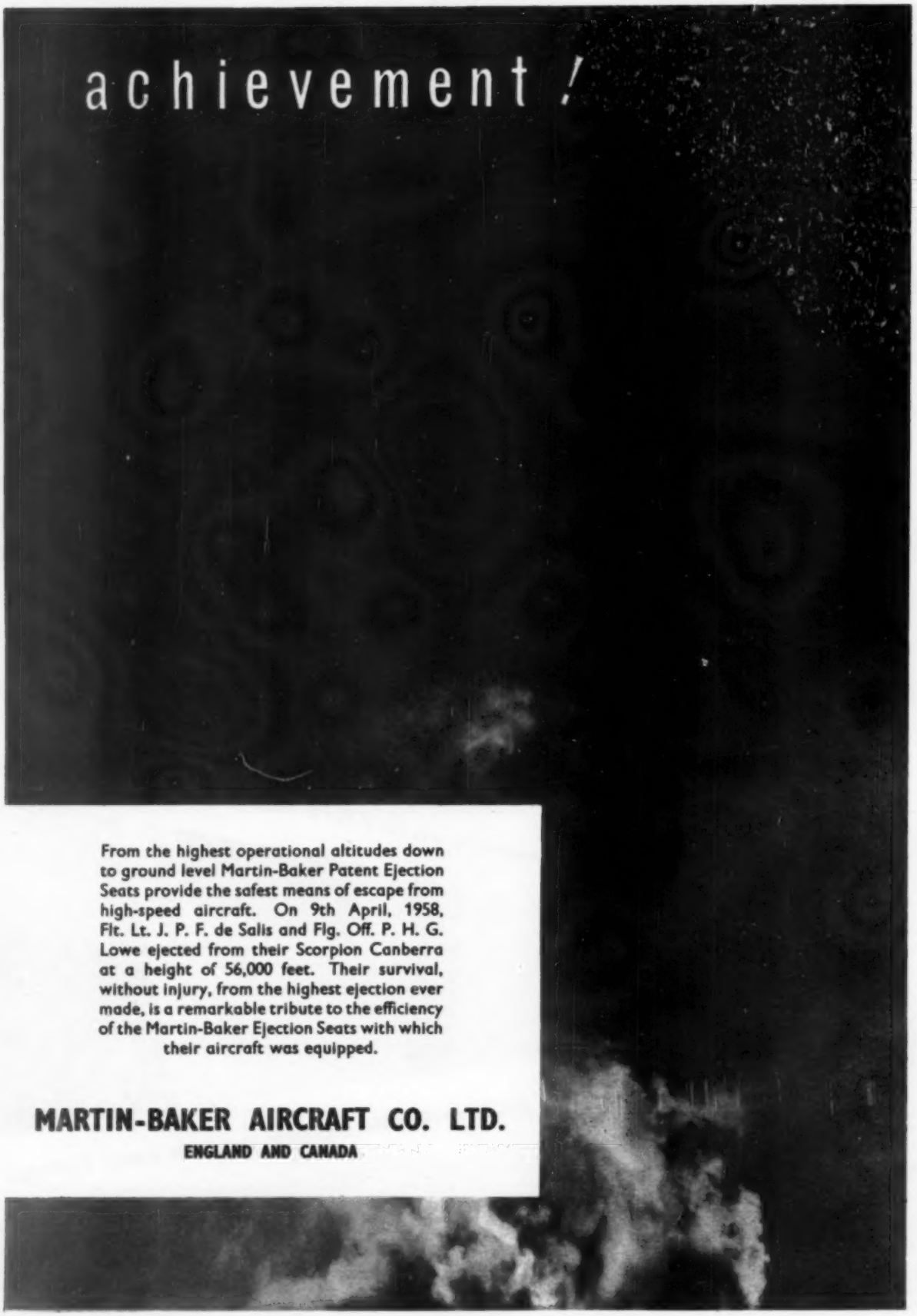

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ENGLAND AND CANADA

Straight and Level

CONGRATULATIONS to Avro Aircraft, of Malton, Ontario—and to the R.C.A.F. and Canadian Department of Defence Production—for building the CF-105 Arrow. In view of the dismal lack of production of really advanced aeroplanes in this country it warms my heart to think of that Canadian factory slapping two-inch-thick slabs of high-strength alloy, each weighing 3,000 lb, on to giant work-tables as a regular production operation. We have, I believe, machines in this country capable of doing similar jobs—one was described in *Aircraft Production* recently—but the work isn't there.

● Explaining why the U.S. organization known as International Aviation Show, Inc., uses the initials "I.A.S." (which, for many years, have signified the Institute of the Aeronautical Sciences), the Show's public relations director, Mr. John K. Purcell, says that "any similarity in the I.A.S. initials of both organizations is purely coincidental . . . the two organizations are in no way connected with each other."

Ah, I see.

● "How many four-engined aeroplanes," Mr. C. J. A. Doughty (Con., East Surrey) asked the Minister recently, "are owned and operated by B.O.A.C. . . ?"

Is not this sort of question a waste of Parliamentary and Ministerial time ? Such facts are readily available.

But Mr. Doughty went on to ask whether B.O.A.C. possessed enough four-engined aircraft to provide adequate services on all the Corporation's routes. Why, I wonder, should this be a matter of public concern? What should be of concern, now that the used-aircraft market is falling so fast, is how hard B.O.A.C. are trying to dispose of their *surplus* four-engined piston aircraft—Constellations, Argonauts and DC-7Cs.

● I liked the juxtaposition of these two news items in *The Daily Telegraph* recently : —

"While fuses were being put into the warhead of an Honest John rocket at Fort Sill, Oklahoma, one of them was heard to click and 25 soldiers standing near took cover. A few moments later the motor of the Honest John started and the missile zigzagged, like a snake, on the ground for 400 yards. Three officers were slightly injured."

"The local branch of the Women's National Farm and Garden Association has taken on the responsibility of beautifying a Nike missile site near Detroit. Several flower beds have been planted around the installation."

I like to think that the plant which these good ladies chose was lunaria—you know, the sort whose pods go click, scattering their seeds in all directions.

● Valkyrie is the name chosen by the U.S.A.F. Strategic Air Command for the awe-inspiring North American B-70 tri-sonic bomber. S.A.C. sponsored a contest to find the right name, and Valkyrie won from 20,235 entries. Curiously enough, the twelve Valkyries of Norse mythology—and Wagner's vast Ring cycle of operas—were not warriors at all; the daughters of Odin, they merely hovered over the battlefield and bore off the favoured fallen to Valhalla. Thus they were little more than servants, or attendants. S.A.C.'s Valkyrie will probably number a good deal more than twelve, even at $25m apiece; and I sincerely hope it will likewise never do anything more than hover over battlefields without joining in—and even that would be frightening enough.

Lady Hunter: My *dear* . . . what on *earth* . . . .
Lady Hawker: Softly old girl. American cousin and all that.
Lady Hunter: But I *mean*. She *may* be a star. And she may have the *duckiest* little place just outside Hollywood. And I wouldn't doubt for one single moment that she's the *fastest* thing since that other airy-fairey piece got herself in the headlines. But I *mean* . . . mincing around the place flashing her 3½ per cent t/c. Anyway, if you ask me, her canopy's bigger than it was. *And* you can't tell me she got that titanium out of her hope chest . . . .

● It is a curious fact that certain shapes and styling forms are universally accepted, while others actually detract from the appearance of an object. Nobody would make a square airliner-porthole look round, but at least five operators of transports with round, or oval, windows have painted their aircraft so that they look square. This may be in order to fool the passenger that his DC-4 is really a DC-6, but it nevertheless looks better.

Now I'm waiting for the first machine to appear with big elliptical paint blobs like the windows of a Viscount, or a row of tiny painted apertures looking like the side of a Boeing 707. We already have painted "swept" fins and "nose radar."

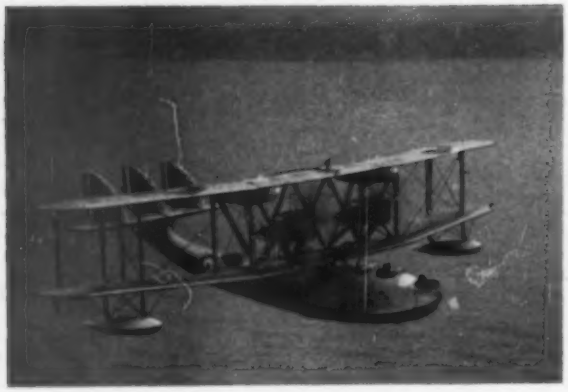
● Are you a trade-union member? If so, do you go to your branch meetings, and speak when you feel you have something to say? Before you answer, "Oh, not *that* old argument again . . ." let me mention briefly that a 50 per cent attendance is quite common in the aircraft plants of the U.S.A. I see that a few days ago the big Douglas plant at Long Beach had a meeting to decide acceptance of a new two-year contract (these labour contracts are worth a comment by themselves). United Auto Workers have Lodge 148 at Long Beach, and of the 13,000 on the Douglas payroll no fewer than 7,000 attended the meeting. Trade-unions are democracies, and in America they are supported as such.

● For many years I have felt that the long ton (i.e., our own unit of 2,240 lb) is an undue handicap in selling our products. It is not very long since a British company spent a great deal of money on an advertising campaign in the U.S.A. for their big airliner, and persisted in referring to its payload of "almost 13 tons"—which, to an American, means something rather more than 25,000 lb. They should, of course, have said "14 tons," since the true figure is 28,000 lb. And what a difference the short ton makes to ease of computation.

The argument for rationalized units is centuries old, but I am bringing it up here to drive home the point that every day some British firm may lose an order somewhere because the prospective customer treats the British ton as 2,000 lb.

● Many months ago I remember seeing a photograph taken in the Chance Vought Aircraft plant in Dallas, Texas, of a Regulus I missile in a roll-over jig in which the entire airframe could be shaken free from dust, grit, loose washers, rivets, bits of rag, newspapers and all the thousand and one odds and ends that accumulate inside during construction. Now I see they are rolling and shaking their F8U Crusaders too. This seems a fine idea, and one that could well be copied—even after the aircraft or missile enters service. I would be interested to see what one could shake out of an elderly piece of R.A.F. equipment. I heard of a packet of cornflakes (by no means empty) being found in a Canberra some months ago.

ROGER BACON



THE BOMB

A FLASHBACK TO THE PRE-ATOMIC AGE

BY the summer of 1933, although I had been in the R.A.F. for eight years, I had never dropped a live bomb, nor had I seen anyone else drop one; in fact, I do not think I had ever seen one in the flesh. To me and my contemporaries live bombs were mysterious engines of destruction which, at the least provocation (or often without provocation at all) blew up and utterly destroyed everything within sight.

At this time I was in a flying-boat squadron, carrying out our annual bombing and gunnery training on the ranges at Tentsmuir in Fifeshire, our Southamptons being at moorings off Newport. The squadron had done very well at Camp (by the unrealistic standards of those days), getting large numbers of hits on the towed targets from point-blank range as well as a fair bag of seals which basked on the sandbanks in the Tay estuary, and achieving some quite spectacular bombing results with 8-lb practice bombs, by a combination of skill and intelligent deception of the range staff regarding bomb-release heights.

Our syllabus was completed, and in the bar we were congratulating ourselves on the healthy margin by which we had beaten the other flying-boat squadrons, and discussing the long leave which was due after this period of activity, when the peaceful atmosphere was shattered by the arrival of a signal from Headquarters Coastal Command announcing that, as a reward for our good results at practice camp, our squadron was to be allowed to drop ONE LIVE BOMB.

Honour indeed to be thus singled out—no flying-boat had dropped a live bomb within living memory. All ranks of the squadron rose to the importance of the occasion; no more was leave discussed in the Mess. THE BOMB was the sole topic of conversation; and who shall blame us if we adopted a slight air of superiority towards the members of other less favoured squadrons?

The C.O. and orderly-room staff produced a monumental operation order, laying down the most exhaustive series of precautions for the reception, handling and dropping of THE BOMB. The infernal machine was to be dropped at least 20 miles out to sea, from as high as the Southampton could climb, aimed at nothing in particular, and only after ensuring most carefully that no shipping or other aircraft were in sight. Would-be spectator aircraft were definitely vetoed—the danger of an "incident" was considered too great.

Lots were to be drawn to decide who should constitute the crew on this epic flight. All flying personnel of the squadron appeared bright-eyed and eager, and everyone expressed, as loudly and as often as possible, the shattering disappointment he would suffer if unlucky in the draw. Of course, strictly to himself, everyone half hoped his own name would not be drawn, for the chances of survival were not considered much better than evens. The squadron commander, with selfless devotion to duty, and disdaining the chances of saving his skin by the luck of the draw, announced that he proposed to pilot the aircraft anyway. While we could scarce forbear to cheer his courage and example, his decision added another uncertainty to the whole affair, for the officer in question, who was putting in the period of "command and flying" necessary for promotion after years of specialist duty, was notoriously out of practice, having only been able to take the air on rare occasions; indeed, a mishap to his own aircraft on the way to practice camp had led to its total destruction on the shores of Loch Lomond.

The draw took place, in an atmosphere of hushed expectancy, in the squadron commander's office. Those whose names were drawn out of the hat feigned elation, though their smiles appeared somewhat forced and foolish. The position of bomb-aimer, the key man of the whole expedition, was drawn by an elderly flight lieutenant, who, though extremely keen and conscientious, had an unfortunate gift for failing to achieve the precise result he so earnestly desired. Henceforward the chosen crew and the bombing-up party underwent a course of intensive and almost uninterrupted briefing and instruction, for the squadron had a high sense of responsibility in executing the honourable task which had been specially allotted to them.

By this time the news, though carefully guarded from the civilian population, had somehow leaked out, and the good townsfolk were filled with alarm and their morale was rapidly sinking. The Mayor visited the squadron commander, who managed to calm him down, more through the medium of alcoholic refreshment than from conviction of the safety of the town. At last a minor panic among the populace announced that THE BOMB had actually arrived, and the more daring of us went to have a look at it. It was one of those already-long-obsolete 250-pounders of 1914-1918 vintage, shaped like a Spanish onion with fins, and would have been regarded by the blasé youth of ten years later almost as a practical joke. To us, however, it was a sinister, untrustworthy Behemoth. Those of us not directly involved watched it being loaded on to the Southampton from a discreet distance. Our heartsh went out to the bombing-up party of armourers, who were perforce in the closest contact with the highly sensitive and destructive infernal machine. When, rather against the run of betting, the brute was passively and safely secured, the armament flight-sergeant reported to the mess (where the chosen few were fortifying themselves against the coming ordeal) that all was ready.

With heavy hearts, throwing in words of precaution and veiled sympathy, we watched the crew go out to what we felt was probably their doom. All were showing signs of strain, particularly the elderly bomb-aimer, who had endured such a spate of briefings and warnings in the last few days that anxiety and confusion were mixed in his wild look. By this time all Fifeshire and Angus on the further shore knew what was afoot, and the banks of the Tay were thick with spectators, who, tempering curiosity with caution, crouched behind any natural cover available to watch what promised to be a Roman Holiday. I myself was detailed to take station in the control boat, a small vessel moored in mid-stream, close past which the aircraft bearing the weapon of mass destruction would roar on its take-off run. I regarded my selection for this hazardous post, after having survived the draw, as a particularly unfriendly and undiscriminatory action on the part of my squadron commander. My anxiety was not lessened by the experience I had had with a previous squadron commander, of roughly the same lack of flying ability as my present one, who had charged into the control boat at high speed, resulting in an impressive degree of damage to both craft.

At last the engines of the Southampton were started up and she taxied up river and turned round; then amidst spray and foam and a thundering of engines, she charged down the river and gracefully left the water just short of where, heart in mouth and fingers crossed, I stood hypnotised in the control boat. A general sigh of relief was just being breathed—nothing to it . . . piece of cake . . . why all the flap?—when suddenly every spectator was struck breathless with horror. As the aircraft came abreast of the control boat, at a height of about twenty feet, THE BOMB was seen to detach itself and plunge towards the waters of the Tay. This was it—the end of the world; our fears had not been groundless.

That fateful second seemed to drag interminably, while we became icily calm. The anxiety that filled us ever since the receipt of that wretched signal from H.Q. left us; this was Kismet, there was nothing we could do about it. In between rapid prayers and a somewhat belated repentance for our sins, our thoughts flashed to our families in their speedily approaching bereavement.

While these mental gymnastics were in progress, THE BOMB gently struck the water, making no more splash than the rise of a large and hungry trout on a still summer's evening, and quietly disappeared. No shattering roar, no blinding flash, no disintegration of aircraft and spectators, no end of everything. We pinched ourselves to make sure that it was not all a nasty dream, and then a look of intense relief and wonder spread over every face; we had been through the Valley of the Shadow, and had come out on the far side unscathed.

The inevitable Court of Inquiry assembled in a few days, presided over by an officer of air rank. While it was deliberating a Naval diving party arrived from Rosyth and proceeded to search the bed of the Tay. Their task was not lightened by the free advice of numerous eye-witnesses, who all pointed in different directions to indicate the exact spot where they had seen THE BOMB strike the water. The finding of the Court was that the bomb-aimer, while suffering from a high degree of excitement and mental stress, had on a sudden impulse released the bomb prematurely; fortunately he had forgotten to fuse it. In its recommendation the Court suggested such a series of restrictive additional regulations and precautions as to make live bombing practice virtually unachievable.

Never, to my knowledge, was another live bomb dropped by a flying-boat during all those long years of peace.

C. B.

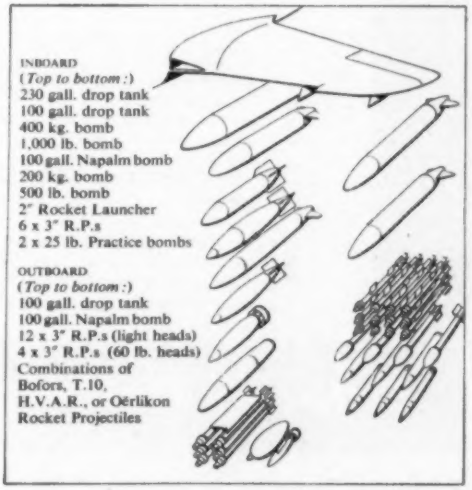
HARDEST HITTER...

...and soonest back in the fight

HUNTER CAN BE REARMED IN FOUR MINUTES. The Hunter F.6 interceptor/ground attack fighter can land from a sortie, be rearmed by means of a removable gun pack in four minutes, and be ready again for the fight. With its four 30 mm Aden guns, using high explosive ammunition, the Hunter has the heaviest fixed gun armament of any ground attack fighter in the world. In gunnery tests from a single aircraft, over 60,000 rounds have been fired at maximum speed and minimum altitude—proving the inherent strength of the Hunter's structure.

In addition, the Hunter carries a greater weight of bombs, missiles or rockets than any comparable fighter. With over 600 gallons in its drop tanks, it combines very long range with manoeuvrability and ease of handling. A landing parachute enables the aircraft to operate from small airfields.

All of which makes the Hunter F.6 the most effective and flexible air weapon a military commander could wish for.



HAWKER HUNTER

THE FINEST INTERCEPTOR/GROUND ATTACK FIGHTER IN THE WORLD
POWERED BY ROLLS-ROYCE AVON

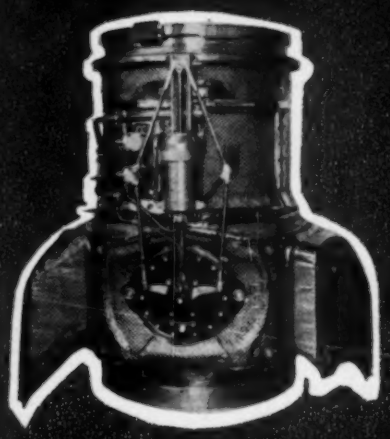
HAWKER AIRCRAFT LIMITED · KINGSTON-ON-THAMES · ENGLAND · *Member of Hawker Siddeley | One of the World's Industrial Leaders.*

Successful heat exchange and heat insulation

Success in our business doesn't merely mean the ability to manufacture, though we are extremely well equipped, even to the extent of having our own aluminium flux bath brazing plant.

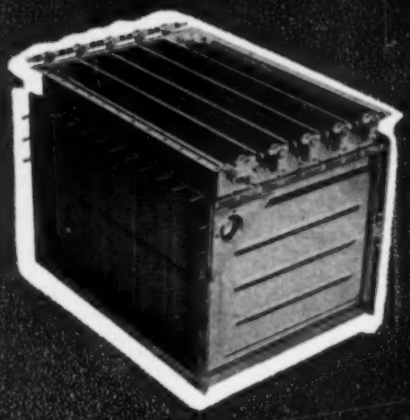
Success to us, means the ability to solve problems; to produce something that will do a new job, or perhaps an old job in never-before-experienced circumstances. And then, of course, to make it a practical and economical proposition.

We have forty years experience and wide resources. If we can help you in any way with heat exchange and insulation equipment, please contact us. We are always at your service.



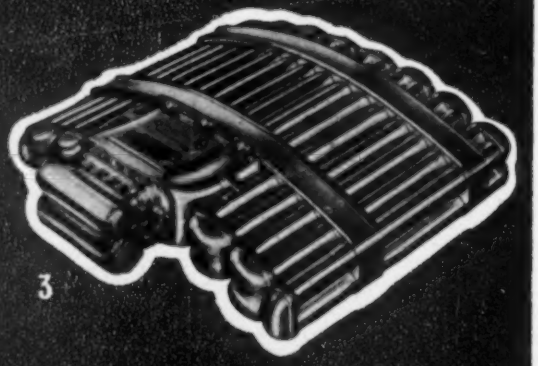
1

These thermal blankets are made of refractory fibre cased in .004 inch (.1016 mm) stainless steel. They are made-to-measure and are extremely light, the dimpled construction being responsible for their great strength. Specified for Rolls-Royce and Armstrong Siddeley jet and turbo-prop engines, these particular examples are shown fitted to the Rolls-Royce thrust reverser for the de Havilland Comet and Sud-Aviation Caravelle.



2

We design, manufacture and supply heat exchangers for many purposes in both aluminium alloy and stainless steel. This particular example is for the Vickers Vanguard's anti-icing system. Similar units are being supplied for the Fokker Friendship, the Bristol Britannia, the Armstrong Whitworth Freightliner and the Vickers Viscount.



3

High pressure fuel-cooled oil cooler for high performance gas turbine engines. This unit is used in the Armstrong Siddeley Sapphire S.A.7.

Delaney Gallay LTD

Vulcan Works, Edgware Rd., London, N.W.2. Tel: GLAdstone 2201

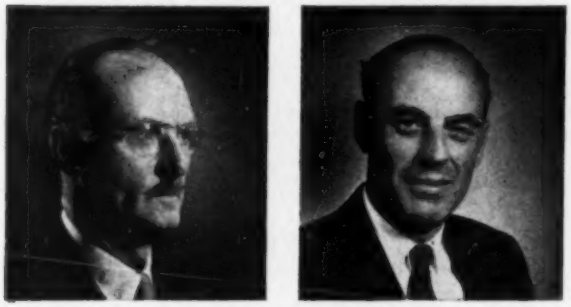
We have now introduced Sealed Thermal Insulation Blankets for Civil Aircraft

THE INDUSTRY

Rotol Appointments

TWO important appointments have been announced by Rotol, Ltd. Lt-Gen. Sir John Evetts has been elected chairman of the company and of British Messier, Ltd., as from July 1; and Mr. C. J. Luby has been appointed managing director of both companies with effect from the same date.

Lt-Gen. Evetts has been managing director of Rotol, Ltd., since



Lt-Gen. Sir John Evetts (left) and Mr. C. J. Luby.

1951 and also managing director of British Messier, Ltd. He is a former Asst. C.I.G.S. (1942); from 1946 to 1949 was chief executive officer, Joint U.K.-Australian Long Range Weapons, Board of Administration; and from 1946 to 1951 was head of the British M.o.S. staff in Australia.

Mr. Cyril J. Luby has been assistant managing director of Rotol, Ltd., since 1956 when he returned to this country from Canada, where he went in 1951 to found Canadian Steel Improvement, Ltd., Toronto, a wholly owned subsidiary of the Steel Improvement and Forge Co. of Cleveland, Ohio. When in 1954 Canadian Steel Improvement was purchased by the Hawker Siddeley Group and became a subsidiary of A. V. Roe (Canada), Ltd., Mr. Luby continued as president of the company.

Survival Equipment Corporation

ARRANGEMENTS have been completed for the manufacture in the U.S.A. of Elliot inflatable liferafts and other air-sea rescue aids, to meet the requirements of American customers and to offer a full range of survival equipment to shipping and aircraft operators in N. America.

A new company, Survival Equipment Corporation, has been formed jointly by Cory Brothers and Co., Ltd. (a member of the Powell Duffryn Group), and Elliot Equipment, Ltd., together with U.S. interests—Estes Industries, Inc., of New York and the C. J. Hendry Co. of San Francisco. Control of the new organization will be held jointly by the two British companies. Survival Equipment Corporation will have its offices in San Francisco and a factory at Sansalito, Cal, where preparations for manufacture are already well advanced. The new company is also to establish service depots at suitable locations throughout the U.S.

Teddington Controls Humidistat

A NEW humidity controller is now being developed by Teddington Aircraft Controls, Ltd., with a view to replacing the mechanical type. The instrument is of the ventilated wet- and dry-bulb type, using electrical resistance thermometers made of nickel wire and glass thread woven into mats. These are mounted in a tube, through which a current of air is induced to flow, either by a small fan fitted at one end, or, if the aircraft cabin arrangements permit, by mounting the tube in the air recirculation duct of the cabin conditioning system. One thermometer is kept wet by a drip feed from a water tank which requires periodical replenishment.

The two resistance-elements are connected in a double bridge circuit which in effect converts the two temperature-readings into a relative humidity signal. A desired relative humidity is set on a potentiometer; and any departure from this value in the atmosphere being controlled, assumed to be always in the too-dry sense, leads to an error signal from the circuit. When amplified in a transistor trigger circuit feeding into a relay, the error signal can operate some form of humidifying device. It is expected that the accuracy of setting will be about 1 per cent, remaining consistent for long periods of storage or service.

IN BRIEF

We regret to record that Arthur Henry Leak, who during the 1914-18 war was with the R.A.E. Farnborough, Armstrong Siddeley and A.B.C. Motors, died recently at his home at Wellfleet, Mass, at the age of 68. He went to the U.S. about 1924 and was with Curtiss at Buffalo and later with the Wright Corporation at Patterson, N.J. Since his retirement some five years ago he had been a consulting engineer on flight refuelling and rocket motors.

* * *

Dummy fuses produced primarily for the aircraft industry by Hellermann, Ltd., Crawley, Sussex, are available in four sizes—PS. 12072 (2 amp), 12073 (2.5 - 5 amp), 12074 (10 amp) and 12075 (40 amp)—and delivery is ex-stock.

* * *

Mr. R. W. Happé, sales manager of the aircraft ground power unit division of Murex Welding Processes, Ltd., has retired after 38 years' service with the company. He was largely responsible for the development of the Murex units and for many years has assisted in aircraft starting arrangements at the S.B.A.C. display at Farnborough.

* * *

Mr. A. W. Morrison, technical director of Expandite, Ltd., the manufacturers of sealing compounds, jointing, waterproofing and anti-corrosion materials, left on July 7 for a three-week trip to the U.S. during which he will visit American organizations with which the company is associated and also testing stations used by the industry.

* * *

T.C. Spray Finishing Systems (Bede), Ltd., have taken over the business of T.C. Spray Finishing Systems, producers of the Economatic Paint Heater and the Bede Airless Spray Painting Equipment. The new Board consists of the original T.C. Spray Finishing System partners—Messrs. Tom Cowlard, R. B. Moss and A. E. Mantell—with the addition of Mr. James A. Bede (U.S.A.) and Mr. G. K. Sargent. The company also announces that Mr. A. A. Dooley, operating from Manchester, is now its representative in Lancashire and Yorkshire.

Mr. W. H. Everard, manager of the electric furnaces, tropenas and heat treatment departments of Edgar Allen and Co., Ltd., has been appointed secretary of the Electric Steelmakers' Guild.

* * *

Ransome and Marles, Ltd., wish to point out that although it is now over a year since they moved their Glasgow office, mail and telephone calls are still being wrongly directed. Their new address is 380 Argyle Street and the telephone number Central 3948.

* * *

A general-purpose analogue computer has been ordered by Sir W. G. Armstrong Whitworth Aircraft, Ltd., from E.M.I. Electronics, Ltd. The computer—an important feature of which is its time division, or mark space ratio multipliers—will be installed at the A.W.A. works at Whitley and is scheduled to be in operation by July next year.

* * *

Mr. J. S. Canning has joined the Board of Ransomes Sims and Jefferies, Ltd., as a non-executive director. He entered the company in 1934, became managing director of Ransomes Sims and Jefferies (Watford), Ltd., in 1949 and since early 1955 has held the post of general sales manager in the main company.

* * *

A useful handbook for the engineer is *Process Heating Data* (second edition), published at 5s by the General Electric Co., Ltd., London, W.C.2. Though primarily concerned with technical data on the many types of G.E.C. industrial heating equipment it also contains numerous tables, charts and other reference material of wide application.

* * *

The British Welding Research Association has recently published a *Memorandum on Non-destructive Methods for the Examination of Welds*, as the last in a series of three booklets forming the B.W.R.A. handbook on non-destructive testing. The latest booklet (T.29/1, replacing an earlier memorandum, T 29, published in March 1952), is obtainable—price 7s 6d—from the publications department, B.W.R.A., 29 Park Crescent, London, W.1.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Croydon Approaches

I SUSPECT that the outcry against the proposed closing of Croydon Airport is sponsored by vested interests who have money tied up in Croydon's proximity to London rather than real interest in the safety factors of this outmoded old meadow.

I have made over the years many hundreds of take-offs and landings at Croydon and almost exclusively in single-engined aircraft. I therefore speak from some experience when I say that there is not one runway there which affords a pilot an even sporting chance in the event of engine failure on take-off—and two of the runways are uphill.

I've spent many a minute after take-off at Croydon looking around and pondering what action—if any—I could take in the event of engine failure and have come to the conclusion that all I could do would be to press on and pray . . . for a thatched roof!

I, and other pilots I have spoken to, will be glad to see this old aerodrome close and be done for ever with its hazardous approaches, ill-siting and criminally over-developed surrounds. Croydon once served a purpose . . . but it *has* served it.

Please do not publish my name for these views are heresy to the hirers of aeroplanes!

London, W.1. CLUB PILOT.

R.A.F. Suicide?

IT is certain that mistakes have been made on all sides. It is also certain that in the event of an emergency now, our major ally, and more importantly the predicted enemy, will be flying front-line aircraft from fighters to bombers at least *twice* as fast as those operated by the R.A.F. (English Electric P.1 excepted, not yet in service). Within five years they will be *three* times as fast.

One can only hope when such an emergency arises, that if our major ally chooses to hold back for a time, the ghastly duty of ordering the R.A.F. to commit suicide will be given to Mr. Sandys —admittedly no consolation, just sheer death-bed vindictiveness.

London, S.W.3. C. D. SOLTZ.

Separation and Safety

DOES Mr. G. H. Lee wish to stir up the dirt in the V.M.C. controversy? There is plenty around and here is a little more.

Why do licensing authorities, including the M.T.C.A., allow aircraft crew complements of only two pilots (no radio officer) in large aircraft where vision is inevitably poor from the first pilot's seat? Two crew who all at the same time may be taking radio weathers, tuning in two separate A.D.F.s, trying to cater for control's needs for E.T.A.s, keeping a log and maintaining an adequate look-out! If collisions occur Maj-Gen. Caldara should not be the only body to feel conscience-stricken.

Incidentally, surely the duty of control is to complement look-out, not replace it?

Chalfont St. Peter, Bucks. F. FOSTER.

Moon Rocket?

IN his letter of July 4, Mr. Bradbury seems to think that because we in Britain do not send a prestige-filled grapefruit into space we will not sell aircraft. I cannot see the connection, since orders for U.S. aircraft do not seem to have poured in since the Americans sent their satellites into space. Any "hard-headed" airline operator will tell you that he wants, not an aircraft backed by prestige, but by sound economics, reliability and passenger appeal. We should concentrate on producing a supersonic airliner, which itself will involve much of our resources, instead of a redundant space traveller which has (in view of the full information we get from both Americans and Russians) a questionable scientific value.

Naturally the cost of putting a British satellite into space would not be high since we have the vehicle—Bluestreak. But as this rocket is supposed to be more advanced than its foreign competitors, why not go the whole hog—to the Moon? This is the real prestige-giver.

Wembley, Middx. H. GINSBERG.

Hendon and Eastchurch

I DO not know if the letter from Mr. B. J. Hurren in your issue of July 4 was written with serious intent; but in case it was, may I point out that the late Sir Richard Fairey was born in 1887, and on Mr. Hurren's evidence must have left Hendon in 1902. So far as Eastchurch is concerned, Short Brothers had their balloon factory at Battersea; it was in late November or early December 1908 that Eustace and Oswald Short were taken to see pastureland at Leysdown by Griffith Brewer, who was seeking a site for an aero club aerodrome. They were quicker to act than the club, and took a lease of the land for an aerodrome and aircraft factory, moving to Shellbeach when the aero club selected it. There was thus no aeronautical activity around Eastchurch in May 1908, nor even in October—unless Mr. Hurren knows of any other model-makers.

Walton-on-Thames, Surrey. DAVID SAWERS.

First Flight

MAY I draw your attention to a letter headed "Sir George Cayley" in *Flight* for May 8, 1909 (page 270)?

London, W.1. F. H. SMITH,
Librarian, the Royal Aeronautical Society.

P.S.: If A. V. Roe flew in 1908, why the letter he wrote in *Flight* for June 12, 1909 (page 353)?

Early Air-brakes

IN reply to the question in the letter from Mr. E. J. Arnsby (May 23), I can confirm that it was not customary for pupils to use the air-brakes on the 1½-Strutters at Cranwell in the early months of the summer of 1917 when I was there as a P.F.O.

The instructors, F/L. Hinchcliffe (who later was lost in an attempted Transatlantic flight) and F/L. S. M. Kinkead (who later flew into the sea during high-speed training for the Schneider Trophy event) advised us not to use the brakes because, at such a busy aerodrome, it was better for the pupils when coming in to land to keep all their attention on the other machines around them and not to risk being distracted by the change of feel on the stick which the use of air-brakes might cause. In any case there was such a long landing area that the use of air-brakes seemed unimportant.

I noted at the time that the 1½-Strutters had a very much longer landing run than the Bristol Bullets and B.E.s which we also flew at Cranwell; possibly the use of air-brakes would have helped to get the tail down more quickly for a good three-pointer.

I also flew 1½-Strutters at another aerodrome which was uncomfortably small and I deliberately omitted to use the air-brakes there so that I could simply open the throttle and go round again if I found I was overshooting.

I experimented in the air by turning the large hand-wheel and applying the air-brakes at cruising speed and noticed no particular change of trim but I remember becoming alarmed at my impression that they were deficient in structural strength at that speed. After that experience I left the brakes alone for the remainder of my short period of training on 1½-Strutters.

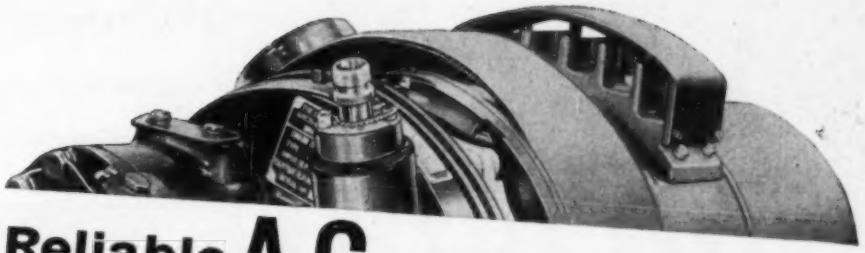
Sale, Cheshire. RONALD SYKES.

IN BRIEF

J. L. Dixon writes from 5 St. Hilda Street, Bridlington, E. Yorks, to say that a few copies of his *A Brief History of No. 7 (B) Squadron* are now available (price 2s 6d); and that he hopes to compile one of No. 48 Sqn. in the near future. Letters from ex-members of the latter squadron would be appreciated.

FORTHCOMING EVENTS

July 19. Fair Oaks Aero Club: Display.
July 19. R.N. Air Stations Eglinton and Culdrose: At Homes.
July 19-20. Calvados Aéro Club: Caen Rally.
July 26. R.N. Air Station Lossiemouth: At Home.
July 26-27. Trente and Bolzano Aero Clubs: Dolomites Circuit.
July 26-Aug. 4. B.G.A.: National Soaring Week.
Aug. 1-16. Czech Aero Club: World Parachute Championship, Bratislava.
Aug. 2. R.N. Air Station Brawdy: At Home.
Aug. 2-4. Plymouth Aero Club: Rally.
Aug. 2-5. S.M.A.E.: Model Aircraft World Championships, College of Aeronautics, Cranfield.
Aug. 9. R.N. Air Stations Yeovilton and Lee-on-Solent: At Homes.
Aug. 16-17. Alsace Aero Club: Rally des Vins, Alsace.
Aug. 31. Oxford Aeroplane Club: At Home, Oxford Airport.
Sept. 1-7. S.B.A.C. Display and Exhibition, Farnborough.
Sept. 8-13. First International Congress of Aeronautical Sciences, Madrid.
Sept. 21. B.G.A.: National Sailplane Aerobatic Contest, Dunstable, Beds.
Sept. 21. Royal Belgian Aero Club: 300 cu m Balloon Competition.
Sept. 21. Milan Aero Club: Rally.
Sept. 26-29. Austrian Aero Club: Innsbruck Rally.



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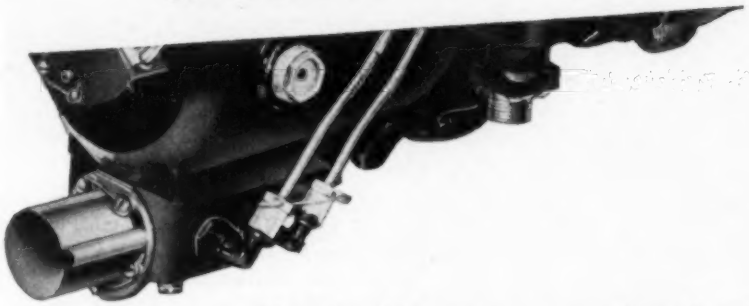

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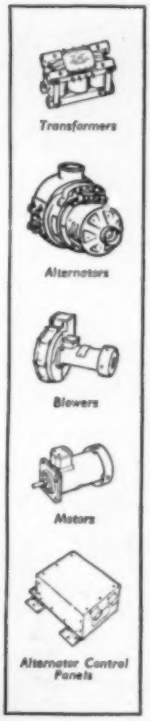

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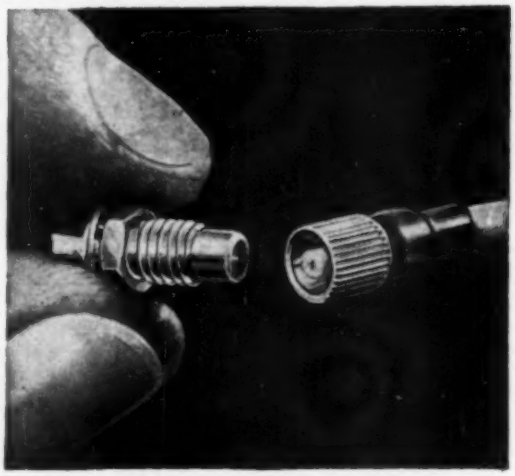

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SERVICE AVIATION

Royal Air Force and Naval Flying News

In the course of visits to H.M.S. "Ark Royal" and to R.A.F. Valley, Anglesey, the Queen Mother is seen (above, left) during her inspection of the ship's company on the flight deck of the aircraft carrier. Accompanying her is the commanding officer, Capt. F. H. E. Hopkins. In the right-hand picture Her Majesty is about to leave R.A.F. Valley by Heron of the Queen's Flight.

Royal Visitor

DURING her recent visit to H.M.S. *Ark Royal* at Devonport, the Queen Mother kept a promise made two years ago (on her last visit) when she expressed a wish to make a presentation to the aircraft carrier, which she herself launched at Birkenhead in 1950, and asked what form it should take. The *Ark Royal* intimated that it would be pleased to receive a ceremonial sash for the Drum Major of its volunteer band, and this Her Majesty placed on the shoulders of Able Seaman Clive Goble, the Drum Major, during her visit to the carrier on July 11.

Her Majesty's informal visit to R.A.F. Valley (see right-hand picture, above) coincided with the opening day of the new officers' mess, which replaces a collection of 17 temporary wartime huts. The new building, one of the largest and by far the most modern in the R.A.F., is considered to be an encouraging symbol for the locally depressed area of Anglesey of the R.A.F.'s intention to remain at the master diversion airfield when so many stations are being closed.

Guided Weapons Post

AN armament specialist since 1937, when he took a course at the R.A.F. Air Armament School, A. Cdre. D. N. Kington-Blair-Oliphant has been appointed Director of Engineering (Guided Weapons) at Air Ministry. He has commanded No. 1 Radio School at R.A.F. Locking since December 1955.

Instructors' Night Out

A RECORD total of 110 members and guests of the C.F.S. Association attended the Central Flying School's 46th anniversary reunion dinner at Little Rissington last Friday (July 11). The guests included the Chief of the Air Staff, Marshal of the R.A.F. Sir Dermot Boyle, and Air Chief Marshal Sir Arthur Longmore, one of the four original instructors when the School opened at Upavon in the summer of 1912. In the chair was the Association's president, Air Marshal Sir John Baldwin, who announced that he will hand over his office shortly to Air Marshal Sir Richard Atcherley, the present A.O.C-in-C. of Flying Training Command.

It was the first opportunity most members had had of meeting the new Commandant, A. Cdre. J. H. N. Whitworth, whose masterly review of the year's work included a tribute to the now-deceased Examining Wing. Overhead as he spoke drifted a cluster of pink balloons trailing banners that advocated (among other things) *Sabrina for Supremo* and *Bring Back the Trappers*, showing that although Examining Wing may be dead its members refuse to lie down. A spark climbed up a cord hanging from the balloons, dissolving the banners in flames and finally exploding the balloons with a wholly-satisfying report. The portrait of "Boom" Trenchard on the wall seemed to smile even more approvingly.

A.V-M. W. M. L. MacDonald, A.C.A.S. (Intelligence), who next December—as announced in "Flight" last week—takes up the appointment of C-in-C., M.E.A.F.

The Commandant's reminder that the training rôle of the C.F.S. is increasingly important now that the fabulously expensive V-bombers demand the highest standards of flying proficiency was elaborated later by Sir Dermot Boyle. He commented that the School could take much of the credit for the fact that the flying accident rate in the R.A.F. is now lower than at any time in its history and that the German Air Force—which knows better than anyone what the R.A.F. can do—has called on this country to meet its flying instructor requirements.

Much of what Sir Dermot said cannot be reported, for this was a family party at which confidences were shared; but he repeated his convictions that the R.A.F. will meet its target of an all-regular service by 1961-62 and that any youngster entering the Service now is assured of a first-class career because unmanned weapons will never replace manned aircraft.

References to one of the aircraft these future pilots might fly—the controversial Canberra replacement—were given an added interest later when A.V-M. W. A. B. Bowen-Buscarlet revealed in coloured chalks on a convenient wall in the anteroom some technical features of a highly classified project of his own design. Intended to avoid the use of what our American friends call critical materials, this unique aircraft has a cat-turbine engine, a three-dog retractable undercarriage, a two-ferret trim device and other equally spectacular but less reportable features.

Above all this was an evening of reminiscence, filled with yarns that ranged from D'Arcy Greig's wing-walking in the 'twenties and Rex Stocken's victory in the spot-landing competition that ended with the School's entire quota of Avro 504s bent beyond further immediate flying, to more recent exploits such as John Lewis's trans-Antarctic flight. It was a privilege to share the company of such men and to be reassured that the traditions of organized flying instruction and disorganized *joie de vivre* that were born at Gosport and Upavon are in as good hands today as ever they were.

Seeing for themselves are the Air Minister, Mr. George Ward (below, left), when he paid an unexpected visit to the R.O.C. summer camp at West Malling, flying from Northolt in his own Chipmunk; and Air Marshal Sir Geoffrey Tuttle, Deputy Chief of the Air Staff (centre of right-hand group), when he visited the Microcell factories at Camberley and Blackwater.

IN BRIEF

Air Marshal Sir George R. Beamish, who recently retired from the R.A.F., has been appointed chairman of the Northern Ireland branch of the R.A.F. Benevolent Fund in succession to Viscount Bury.

* * * * *

The R.A.F. Benevolent Fund last year assisted 4,905 applicants for the first time, bringing the number of assisted applicants on its books to 189,227 and the number of grants and loans made since the Fund was founded (in 1919) to 400,332. These figures are given in the Fund's report for 1957, published recently.

* * * * *

It is hoped to hold a reunion in the near future of No. 263 Sqn., which was disbanded on July 1 and re-formed the following day as No. 1 Sqn. Ex-members are reminded that No. 263 Sqn. ties and badges can still be obtained by writing to the Adjutant, No. 1 Squadron, R.A.F. Stradishall, nr. Newmarket, Suffolk.

CIVIL AVIATION

Captain Soldatov brought his Tu-104 to rest 5,250ft from touchdown when coming into Schiphol for the first time. He later said that Aeroflot now has 70 Tu-104s in service.

MOUSE OR MOUNTAIN?

AS if T.W.A. hadn't already plenty to think about—with a new chairman only having just been appointed, 1,000 staff being dismissed, losses this year already amounting to many millions of dollars, and 33 Boeing 707s and 30 Convair 880s on order—rumours are again starting to circulate as to a fleet of 32 Britannias having been bought by Howard Hughes (whose company holds about threequarters of T.W.A.'s stock).

Mr. Peter Masefield, Bristol Aircraft's managing director, recently went across to Vancouver on one of the six Britannias being delivered to C.P.A.L. From Vancouver he slipped down to Los Angeles to be present at the current National Summer Meeting of the Institute of the Aeronautical Sciences. There, not surprisingly, he met Howard Hughes and talked of many things. And of their discussion was reborn the idea that has apparently been dead and buried for 18 months.

A statement from T.W.A.'s annual report for 1957 provides an interesting sidelight to the Britannia story. Discussing the Boeing and Convair orders it states that "Hughes is not committed to sell any of these aircraft to T.W.A., nor is T.W.A. committed to buy any of them from Hughes."

CHARTING THE AIR

FEW documents are more basic to airline needs than the Route Manual. In the past International Aeradio's flight documents have been provided in the form of loose-leaf books which had to be kept up to date by the insertion of fresh pages. In an industry rightly preoccupied with documentary facilitation, this arrangement has been causing increasing inconvenience. Bulky, loose-leaf books are always clumsy to handle on the flight deck, but as the books grow thicker and aircraft weave their way ever more rapidly along complex routes, so the reference value of such guides is diminished. Furthermore there is the constant danger of pages being mislaid and the administrative inconvenience of keeping the guides up to date.

Aeradio have naturally been aware of this problem for some time, and have recently been experimenting with their African coverage. Instead of the previous method, completely reprinted books will now be issued at frequent intervals. Not only are the new issues distinctly more attractive, but the use of a spiral wire binding allows the book to open—and stay—flat.

To discuss this new presentation with the users, Aeradio earlier this month convened a conference in London, particular attention being given to coverage for Europe and the Middle East. The congestion here is such—703 approach/landing charts and 16 radio navigation charts being required for this area alone—that coverage is probably best achieved by the use of four manuals: U.K. and Continental Seaboard; Scandinavia; South West Europe; Central Europe and the Middle East.

Operating between New York's three airports and Manhattan, N.Y.A.'s fleet of five Vertol 44Bs is now in service. One of these aircraft (right) is shown almost directly over the United States Lines quays.

Some erasing needs to be done before an airline decides on a satisfactory livery. Ghana Airways' Stratocruisers (one of which is seen below), no longer bear B.O.A.C. initials and instead show a winged star over the airline's own name.

REFUELLING-STOP

THE Delhi-Moscow proving flight that Air-India International had scheduled for late June has been postponed. This delay is attributed to the non-availability in Soviet Russia of the grade 115-145 octane fuel required for Air-India's L.1049Gs. This particular type of aviation fuel is not used by any Soviet type of aircraft and, therefore, is not normally produced there.

Under the Indo-Soviet air pact, Russian authorities were reported to have undertaken to manufacture the 115-145 octane fuel, on the basis of which understanding Air-India had planned to undertake the proving flight on June 28. But it now appears that a sample of the fuel refined in the U.S.S.R. was sent to India and found to be not up to the specifications of Air-India. The proving flight is now expected to be undertaken later in July or August.

ETHIOPIAN AIRWAYS' PROFIT DOWN

THE experience of most European and American airlines in 1957—revenue up, profit down—was shared by Ethiopian Airlines. Operating revenue rose by 12 per cent to Eth.$12m (£1.7m) but costs increased by 18 per cent. Thus profit dropped sharply despite a rise in load factor from 52 to 56 per cent (l.t.m.s. rising by 16 per cent, and c.t.m.s. by only 8 per cent). Ethiopian's picture, then, is one of unit costs rising as revenue rates fall.

A factor behind the cost rise was the unfortunate loss in July of an L.749, the airline's only 4-engined aircraft, within a month of accepting delivery and after considerable introduction expenditure had been incurred. Prospects for 1958 are brighter with three DC-6Bs being put into operation and new services planned, including an extension to Frankfurt.

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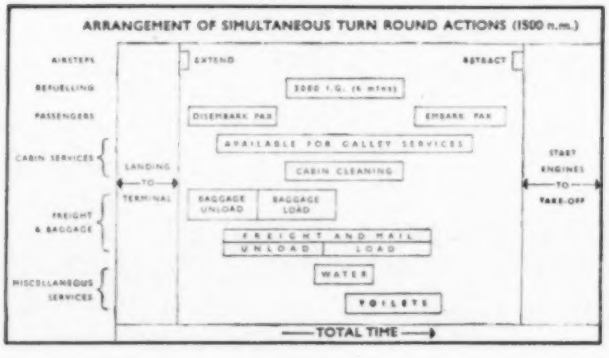

For your notebook . . .

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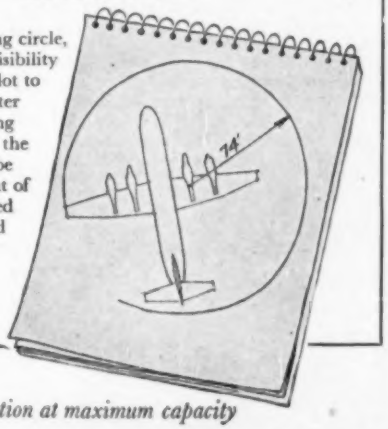

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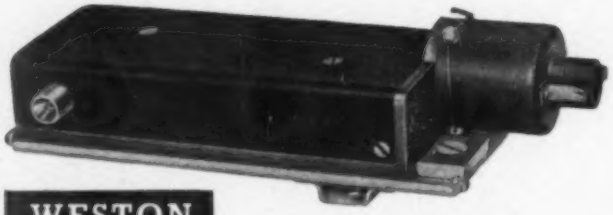

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CIVIL AVIATION . . .

IT'S THE ARGOSY

LAST week, the managing director of Sir W. G. Armstrong Whitworth Aircraft, Ltd., Mr. H. M. Woodhams, announced that after a study of over four hundred different names, "Argosy" had been chosen for the A.W.650 Freightercoach. *Flight* has reason to applaud this choice, which was suggested in an editorial on October 5, 1956. The 1926 A.W.A. Argosy inaugurated the London to Paris Silver Wing lunchtime service, and achieved the operational distinction of requiring only one significant modification.

A.W.A. will now presumably have to consider new names for the A.W.670 Air Ferry and A.W.671 Airbus, since, like "Freightercoach," these are aircraft type names, although they are both aptly descriptive of the respective rôles of the two machines. The name Argosy applies only to the four-Dart version of the Freightercoach.

The firm also announced last week that the direct operating costs (total operating costs for aircraft in service are shown by experience to be about twice the d.o.c.) of the Airbus, with 90 seats on the lower deck and 30 seats on the upper deck, would be less than 2d per mile on stages as short as 200 miles, although detailed assumptions were not stated. Interest in this version of the Group's series of twin-boom aircraft has been expressed by Mr. M. L. Thomas, managing director of Jersey Airlines, who is the first British operator to ask for a demonstration.

Present plans, however, are mainly concentrated upon the longer range A.W.650, which should fly before the end of the year. This is a conservative target-date, and it gives A.W.A. working room for ample ground-testing and resonance checks to be completed, and the first aircraft will fly with the pressurization system in operation.

The company are meanwhile carrying out most exhaustive structural and fatigue testing of the airframe; the second wing and fuselage to be built will be tested to ultimate load and to destruction and the third will be fatigue-tested. Water tank tests are already under way on the pressurized fuselage. Although the fuselage and booms are built on very up-to-date fail-safe principles, A.W.A. are guaranteeing a declared safe-life (see *Flight*, May 30, 1958) for the whole airframe. This is necessary because the wing, a modified Shackleton design, is not fully in accord with modern fail-safe precepts, and though it can, and will, be very thoroughly proven, modern engineering thought expresses reservations about safe-life designs. It seems possible that the shorter range A.W.670 and 671 will have a redesigned wing, since the difficulties of guaranteeing very long safe life rise rapidly where frequent landings and take-offs, associated with short-haul work, are involved.

GUARDIANS OF THE PEACE

WRITING in the latest issue of the *BEA Magazine*, Lord Douglas makes an unusual comment—unusual, at any rate, coming from the chairman of a nationalized corporation—on Government policy.

Lord Douglas describes as "galling" the fact that B.E.A. have been "pipped at the post" by Sabena, who inaugurated Brussels - Moscow services (with connections to London) on June 2; K.L.M. and Air France may also, he points out, be operating into Moscow before B.E.A. "It is now nearly five months since I returned from Moscow," writes Lord Douglas, when he had "high hopes" that a service on "this most important route" would start this summer. "The hold-up has been due," he says, "to the fact that the Ministry of Transport and Civil Aviation has so far not been able to accept . . . the noise level of the Tu-104."

The Russians, according to B.E.A.'s chairman, say that silencing the Tu-104 is not feasible without "unacceptable" performance penalties; and that the Il-18 turboprop—the only alternative equipment—will not be ready for international operations until next year.

Lord Douglas declares that unless "this most difficult situation" is resolved quite soon, the country's position as one of the focal points of international air transport could easily be harmed.

In the meantime, the Minister, Mr. Harold Watkinson, has returned from a five-day visit to the U.S.A. and Canada, when he discussed the jet noise problem with the Port of New York Authority. Though he was non-committal when questioned, it seems quite clear that the P.N.Y.A.—who are fighting the battle against jet noise for the whole world, and whose policy appears to be mirrored by the M.T.C.A.—have not yet approved either the Boeing 707 or the Comet 4 for scheduled operations into New York. (The Comet 2 and 4 have conditional approval.)

The Ministry are not likely to accept the 707 at London unless it is accepted by New York; and thus the prospect of transatlantic services between the two capitals this autumn by PanAm and B.O.A.C. now seems remoter. The outcome of the "race" between the 707 and the Comet 4 to be first on the route is in the hands of those who have assumed the unenviable responsibility of deciding what measure of jet noise does, or does not, constitute a disturbance of the peace.

London's experience of the Tu-104—brief though it has been—was a pointer to the possibility of future public litigation against jet noise. The P.N.Y.A. and the M.T.C.A. no doubt have in mind the possibility that the laws of America and England may one day rule that the noise of the civil jets—even at the low take-off powers of their early development life—does indeed constitute a disturbance of the peace. What then?

B.E.A. VISCOUNT ACCIDENT UNEXPLAINED

INVESTIGATION departments have become so skilful in the reconstruction of the circumstances leading up to an accident that an unexplained disaster is most unusual. Yet the accident to the B.E.A. Viscount 802 after a G.C.A. approach to Nutt's Corner Airport, Belfast, last October 23 was described at the Public Inquiry in London which concluded on July 10 as "a wholly unexplained calamity." The Solicitor-General, Sir Harry Hylton-Foster, Q.C., said that it was easy enough to tell what the movements of the aircraft had been; but why disaster overtook it was a very puzzling problem.

As a part of the inquiry, tests had been undertaken to see if it were possible for a screwdriver, which had been found in a bent condition near the wreckage, to have jammed the controls by dropping through a hole in the cockpit floor. This was considered by Vickers and by the Solicitor-General to be most unlikely. "It really is stretching the mysteries of the accident to the very limit," declared Sir Harry, "that it should be just at this moment that this extraneous object should have dropped into the one desperate position which it had not been in before." A report is to be published, and will be summarized in *Flight*.

MORE AIR FRANCE CARAVELLES

THE Sud Aviation Caravelle order-book rose to 44 last week when Air France took up their option on a further 12 aircraft, bringing their total fleet to 24. Although details are not yet available for publication, the second 12 will embody certain improvements—including greater power (probably RA.29s at an 11,700-lb take-off rating). Last week-end the first aircraft of the original order was handed over to Air France at Toulouse, when Monsieur Max Hymans, chairman of the French airline, hoped to order more Caravelles in the early 'sixties.

Other Caravelle news originating at the ceremony was that T.A.A. (whose chairman, W. D. McDonald, was present) are still hoping for Australian Government permission to buy two Caravelles, notwithstanding the recent pressure put upon T.A.A. to purchase Electras. It was also stated by the president of Sud Aviation, Monsieur Hereil, that the firm is optimistic about possible U.S. orders for the Caravelle, which might still (it is understood) be licence-built in America by Republic.

A JOB FOR STATISTICIANS

THE Boeing Airplane Co. is displaying an increasing interest in the independent conduct of market surveys. The most monumental examples of this are the two freight studies carried out for Boeing by the University of Washington. One of the next studies is to be an investigation into European travel "to be carried out by an independent research agency not yet selected." This would follow the lines of another survey at present being made by the University of Michigan Survey Research Center to learn "who travels and why, and why travellers use one mode of transportation rather than another." Boeing's foreign market analyst, Mr. George Szukovathy, considers that these surveys will be repeated at least every two years.

The Comet 4 did some important business-entertaining last week; seen here, from l. to r. just before take-off, at Hatfield, are Mr. A. F. Burke, D.H. Aircraft managing director; Sir George Cribbett, B.O.A.C.'s deputy chairman; and Mr. D. Bustard of B.O.A.C. Guests who flew at other times in the aircraft last week were Air Marshal Sir A. McKee; Mr. Airey Neave; Sir Charles Guest; Mr. A. H. Wilson; Mr. E. C. Bowyer; and Sir Cyril Musgrave.

L.A.P.'s CAPACITY

OWING to last-minute pressure on space, this article could not—as was intended—appear in the same issue as last week's "Straight and Level" discussion of London Airport's future capacity. The author, Mr. J. MacDonald, is an air traffic control officer at London Airport; he states that the views he expresses are his own, and must not be taken as reflecting official opinions or policy.

IF you are planning to enlarge a theatre or cinema it is unwise to assume that existing entrances or exits will suffice (or might even be reduced) on the basis that future patrons may agree to enter at the double where in the past they preferred a safe and orderly shuffle. In the same way, airport planners cannot assume with any certainty that in the future aircraft will land at a significantly faster rate in poor visibility than they do today.

It is a common fallacy to attribute the limiting of landing and departure rates to Air Traffic Control. The fact is that A.T.C. at an airport at which radar positioning is mandatory can arrange to place one aircraft behind another on final approach at any distance from 100 yd to 10 miles according to the demand. Spacing is governed in the end by the pilots, who may or may not clear the runway in time to avoid the necessity for succeeding aircraft to overshoot, and who, when approaching in bad visibility, after all have the right to specify the minimum separation compatible with their peace of mind. It is doubtful whether peace of mind will increase appreciably in the next 12 years.

We learn from the London Airport Development Committee's report that future development of the airport assumes the possibility of achieving by 1970 a peak rate of 40 landings and 40 departures in one hour. It is presumed that this involves the use of two separate parallel runways, and from these figures it appears on average that over a sustained period of 60 minutes an aircraft will touch down every 1½ minutes, or that each aircraft will be separated by three miles on the approach; simultaneously, aircraft will be departing at 1½-minute intervals. In visibility of 500-600 yd such traffic density would appear, to say the least, a little uncomfortable. Despite the provision of frequent fast turn-off curves and airfield surveillance radar, aircraft will for a variety of reasons continue to dally on the runway: no one can blame the captains of large international aircraft if they do not quite fancy operating like pilots of a fighter squadron. A departure rate of one aircraft every 1½ minutes is decidedly optimistic unless very considerable co-operation is anticipated from all concerned. It will be necessary for every departure to take off "on the roll," without any hesitation on the threshold, and outbound radar techniques will require revision.

If, as is bound to happen from time to time, only one runway is available for both landing and departing traffic, an offering of 80 movements per hour in poor visibility will be something of a calamity. Less than half that number are likely to be handled if any kind of safety margin is to be retained. A recent practical suggestion for improving the situation with regard to single runway operation is an arrangement with several fast turn-offs to enable the departing aircraft to be lined up in readiness to roll as soon as the landing aircraft turns off; but this cannot perform miracles in terms of movement rates.

It seems clear that for future movements there must *always* be two separate runways (preferably parallel) for simultaneous use. The existing design of London Airport permits operation of two separate parellel runways in six different directions according to wind—operationally a very comprehensive layout. However, in order to provide additional parking space in the central terminal area the Development Committee report recommends that the two parallel runways lying N.W./S.E. be taken out of use in two stages. This will of course leave the two parallel N.E./S.W. runways to meet the situation when the gales blow up from north to south, and how far they will in fact meet the situation will depend on the wind velocity.

Assuming that a strong wind is blowing from 165 deg, the landing direction can be either 100 deg or 230 deg (Runways 10 or 23). Whichever is used there will be a cross-wind at an angle of 65 degrees. Should the wind strength exceed approximately 20 kt, aircraft such as Dakotas, Vikings or Stratocruisers will be unable to land; if it exceeds 25 kt Britannias, Constellations and Convairs will be unable to land, and if it exceeds 35 kt Viscounts will not get in. A similar situation will arise in the case of a strong wind from 345 deg, the choice of runways being 28 or 05.

To show that strong winds from an awkward angle do occur, however infrequently, the following may be quoted as records of surface-wind velocity taken at London Airport on November 4, 1957:—

Time	Mean surface wind (deg.)	(kt.)	Gusts (kt.)
2040	—	—	30
2053	—	—	34
2057	170	22	—
2120	—	—	32
2128	170	24	—
2156	170	22	—
2227	170	23	—
2229	—	—	35
2237	—	—	34

During this period of approximately two hours, had the N.W./S.E. runways not been available, landing would have been impossible in a number of cases and critical in all.

It must be added that, if we consider the wind factor alone, the occasions on which it is essential to use the N.W./S.E. runways are comparatively rare—meteorological statistics show an average of 12 hours per year. There is, however, no recorded assessment of the potential usefulness of the N.W./S.E. landing direction on occasions when main E./W. runways are out of action for repair or for maintenance of equipment. We cannot skip lightly over the fact that runways are out of service for several days, or sometimes even weeks or months on end. At the rate of 80 or 40 movements per hour there will scarcely be time, between one landing aircraft and the next, to dash out and lift and replace a pit-cover.

Crossing of active runways by towed or taxying aircraft or vehicles is a formidable problem which often fails to receive due recognition when movement rates and schedules are being considered. As long as the servicing areas are not part of the central terminal area this matter has to be faced, and for every machine towed across the operational strip one must deduct a landing or departing movement.

In considering aircraft movements it is natural to make comparisons with major airports in other parts of the world. Figures used in such comparisons should be examined very carefully before any conclusions are drawn. It is important to separate I.M.C. from V.M.C., scheduled from non-scheduled flights, and light aircraft and helicopters from the rest; some consideration should also be given to local factors, e.g., light aircraft making continuous circuits on part of the airport which may be quite separate from the operational runways. As a general rule, traffic which is prepared to operate only in V.M.C. can be fitted in with little adverse affect on regular flights, hence airports blessed with good weather and which have an abundance of V.M.C. operations may show impressive annual figures whilst being comparatively inefficient in conditions of poor visibility. On the other hand, an airport which is forced to plan on the basis of poor weather conditions may secure a good record of regularity but a less inspiring annual total.

If forty aircraft are scheduled to arrive in a sixty-minute period and the landing rate cannot be increased beyond one every three minutes, it is obvious that twenty will be delayed into the next hour, with a subsequent cumulative effect. As traffic increases there will be a growing need, in everybody's interest, for a responsible body to fix a limit on hourly schedules and to spread the traffic more into operationally less attractive periods—perhaps made cheaper by reduced landing fees and reduced fares. As landing and departure sequences become tighter those directly concerned, i.e., pilots and A.T.C. officers, must logically be permitted a greater voice in the determination of hourly figures.

In the report already mentioned it is stated that the assumed movement rates at London Airport of 80 movements per hour and 64 movements per hour for periods of more than an hour "will tax Air Traffic Control to the limit." This suggests incorrectly that the A.T.C. organization is the limiting factor; actually safety and common sense are the true limiting factors.

It would seem wiser to avoid straining the links in the operational chain by arranging for the scheduled traffic to be spread more evenly over at least a sixteen-hour period, and by limiting the hourly schedules to something realistic that assumes the worst conditions. On this basis, if conditions permit, non-scheduled traffic can also be fitted in without affecting regular flights, and duplicate services can be run and diversions accepted without overloading the system. An hourly schedule maximum of 25 landings and 25 departures would seem to be a reasonable basis, or a total of 50 landings or departing aircraft each hour. This would lead to a maximum of approximately 800 per 16-hour period (0800 to midnight) and approximately 900 per day. Total for the six summer months could be approximately 160,000 and that for the six winter months 80,000, making a theoretical annual total of 240,000 regular flights.

	Per Hour				Annual Totals	
	Land.	Dep.	Total	Remarks	1960	1970
Forecast capacity in the report of the London Airport Development Committee.	40	40	80	Limited to 1 hr.	132,000	211,000
	—	—	64	For more than 1 hr.	—	—
Suggested in this article as a more realistic basis for scheduling.	25	25	50	Continuous for 16 hr.		Possible 240,000

Total movements at London Airport, 1957 116,101
Total movements at Chicago, 1957 408,059

BREVITIES

S.A.S. has been granted traffic rights at Anchorage by the U.S. State Department. The Scandinavian Governments are reported to have dropped their demands for traffic rights at New York on their Latin American services in the hope of securing rights at Anchorage and Chicago. S.A.S. is already operating polar services to Los Angeles and Tokyo.

* * *

West Coast Airlines were due to take delivery of their first F-27 on July 15.

* * *

East African Airways have vacated Wilson Aerodrome and are now based entirely at Nairobi Airport (Embakasi).

* * *

The independent Belgian airline Aviameer has taken delivery of a Viking from Luftransport Union.

* * *

Revisions are expected shortly to the bilateral agreements between India and Italy, Czechoslovakia and Western Germany.

* * *

Questions have been asked in the Argentine Chamber of Deputies as to whether Aerolineas Argentinas' order for Comet 4s has been signed.

* * *

The C.A.B. has dismissed applications by Lineas Aereas Mexicanes and Aero Transportes to fly from Mexico to San Antonio and Los Angeles respectively.

* * *

D.C. Transit System, a company associated with Trans-Caribbean Airways, has applied to the C.A.B. to operate scheduled helicopter services in the vicinity of Washington.

* * *

Two Vikings have been sold by Eagle to East Anglian Flying Services, Ltd. (Channel Airways), another having been sold to the newly formed Pegasus Airways.

* * *

PanAm have withdrawn their flight staff from Beirut to London as a precaution against possible hazard during the present unrest in the Lebanon.

* * *

On July 9 an Indian Airlines Corp. DC-3 on a freight flight from Agartala to Calcutta crashed at Dacca. There were no survivors from the crew of three. On July 8 a Norduyn Norseman operated by Gibbes Sepik Airways crashed near Mendi, New Guinea, while on a charter flight. The aircraft was destroyed and the pilot killed.

Blackburn Beverley G-AMVW (ex-WZ889) is being offered for sale by the Ministry of Supply.

* * *

Alitalia, Lufthansa and Air France have agreed to a ticket-pool on their South Atlantic services.

* * *

Eagle Airways have withdrawn their once-weekly Viscount service from Manchester to Frankfurt via Brussels.

* * *

British Aviation Services are reported to be planning to suspend Aquila's flying-boat services at the close of the summer season.

* * *

Air Ceylon is reported to be about to order turboprops, probably Fokker F-27s, for use on short haul routes.

* * *

Slick Airways are selling all their 11 DC-6As. Present sales include two each to PanAm and to the Belgian Government, and one each to Hawaiian, Alaska and Overseas National.

* * *

Instead of reducing K.L.M.'s frequency from three to two flights per week, the Indian Government has agreed to allow two flights through Calcutta and one through Delhi.

* * *

Cardiff Airport terminal buildings have been completed and the subsidiary runway lengthened to 3,700ft at a cost of £100,000. Direct services are now planned to London, Manchester and the Midlands.

* * *

Member airlines of I.A.T.A. are considering a reduction of about 17 per cent in commodity rates for textiles and apparel across the North Atlantic. If agreed, the new rates will come into force in September.

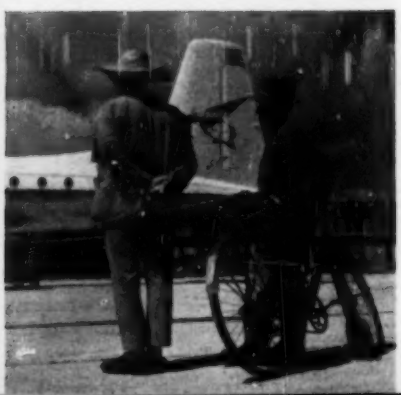
* * *

B.O.A.C. has placed an order with Microcell, Ltd., for 1,600 seats for installation in their 15 Boeing 707s. The Corporation's policy is "to have as much British equipment as possible fitted in the 707 fleet."

* * *

An air services agreement has been signed between the U.K. and Ethiopia to cover operations between Ethiopia and adjoining British territories. This agreement replaces the provisional arrangement that has prevailed in the past.

Early last month G-ANCD left Filton in Cubana colours bound for Havana. On the way it was inspected under the glare of the Spanish sun (below, right) and was later "handled" (below, left) by the U.S.A.F. at Lages in the Azores. After twice sallying forth from Cuba to the States, the aircraft sped southwards to Buenos Aires. On the right the Britannia returns from a demonstration flight, unperturbed by Aeroparque's 1,700 yd runway. Turning homeward the aircraft continued to Rio de Janeiro from where it crossed Brazil's bleak interior (below, centre) to reach Caracas in a record block speed of 338 m.p.h. At the end of June Charlie Dog returned to Filton.



Excellent cockpit visibility and a sprightly appearance are features of the PZL.102 Kos, the new Polish two-seater described below. The machine is powered by a 65 h.p. WN-1 engine.

Club and Gliding News

Polish Blackbird

A ONE-DAY visitor to the World Gliding Championships at Leszno last month was the brand-new PZL.102 Kos (Blackbird) two-seater produced by Polskie Zaklady Lotnicze at Okecie. This attractive sports aircraft, the subject of these *Flight* photographs, is powered by a Polish WN-1 flat-four engine of 65 h.p. and is of all-metal construction.

The PZL design team, led by engineer Lassota, began work on the Kos in August 1957, and the prototype flew in May this year. Intended primarily for touring and club use, the machine appears to be a logical and simple design.

The wings are of monocoque metal construction, with a single spar and a forward torsion-box. Attachment of each wing to the fuselage is by three bolts, and fabric covering of the wing is incorporated aft of the spar. Slotted differential ailerons and split flaps are fitted.

The fuselage is built in two sections, front and rear, which are attached by four bolts. The front fuselage is a welded tubular structure with metal covering, and accommodates the side-by-side two-seat cockpit. Behind the seats is a baggage compartment. Dual, adjustable control wheels and rudder pedals are fitted, and the flap control is located between the two seats. The rear section fuselage is of monocoque metal construction.

Attachment of the all-metal tailplane is by three bolted fittings, which permit the ground adjustment of tailplane incidence. The elevator structure is metal with fabric covering. Construction of the fin and rudder is similar to that of tailplane and elevator, and both control surfaces are aerodynamically balanced.

The main undercarriage legs incorporate oleo-pneumatic shock-absorbers and the wheels are equipped with hydraulic brakes. The tailwheel, which can rotate freely about 360 deg, has a rubber-cord shock-absorber.

Power unit of the prototype PZL.102 is a 65 h.p. horizontally opposed four-cylinder engine designed by Wiktor Narkiewicz and known as the WN-1. This was the first indigenous postwar aero-engine to be produced in Poland. Alternative 65 h.p. or 85 h.p. engines of foreign manufacture can be fitted to the Kos if required. A wooden, fixed-pitch propeller is employed.

PZL.102 Kos (65 h.p. WN-1 engine)

Dimensions and Performance: Span 27ft 5in, length 20ft 11in, height 6ft 2in, empty weight 745 lb, gross weight 1,255 lb, wing loading 10.6 lb/sq ft, cruising speed 96 m.p.h., maximum speed 102 m.p.h., minimum speed (flaps up) 51 m.p.h., (flaps down) 47 m.p.h., range 310 miles, duration 4 hr 30 min, fuel capacity 13 gal, take-off run 257 yd, distance to clear 50ft 462 yd, landing distance from 50ft 356 yd. **Export Agents:** Motoimport, Przemyslowa 26, Warsaw, Poland.

The Tass caption to this picture of the new Russian A-11 glider states: "New all-metallic glider having a tail support resembling the wings of a butterfly can make complex figures of high-class pilotage. Glider is equipped with in-cloud flying devices and can develope a speed up to 400 km/hr. Due to the spread of its wings which is 16 metres it has good soaring properties."

ORIGINALLY planned for July 20, the Fair Oaks Aero Club air display has been advanced by a day and is being held tomorrow (Saturday, July 19). Club officials hope this change will coincide with fine weather in the Chobham area of Surrey.

BECAUSE of low cloud it was possible to fly on only two days out of five on the Yorkshire Gliding Club's second course, held from June 29 to July 5; so on the Friday (July 4) the C.F.I., Henry Doktor, took five course members to Welburn airfield, near Kirbymoorside, where four gained "A" certificates on the Tutor.

IF present negotiations are successful the Halifax Gliding Club will be able to continue flying from Sherburn airfield (which closed on June 30) for at least a further three months, and there is a possibility that the Yorkshire Gliding Club will again operate from there. The Yorkshire club are interested in Clifton aerodrome, York, as a possible flat site alternative to Sherburn.

AT Andover on July 7 Thruxton Airfield and adjoining agricultural land was sold by auction on behalf of the Secretary of State for Air. The airfield was sold for £27,600 subject to a tenancy by Wiltshire School of Flying and another tenant. The remainder was offered with vacant possession. Strutt and Parker, Lofts and Warner, of Berkeley Square, London, conducted the sale.

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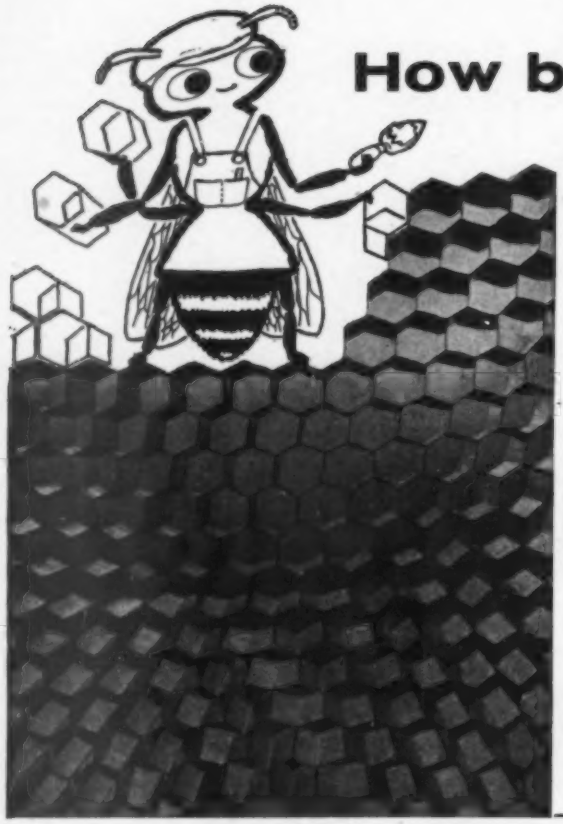

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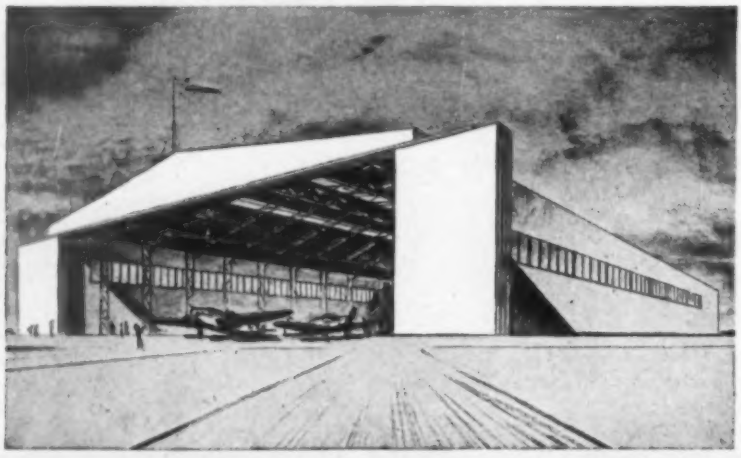

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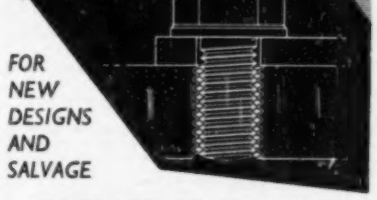

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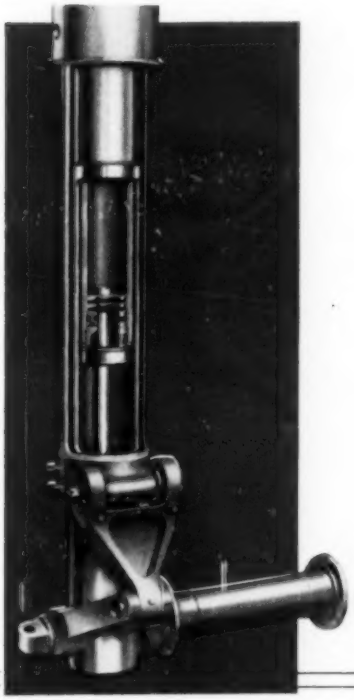


The Bristol Freighters are all equipped with

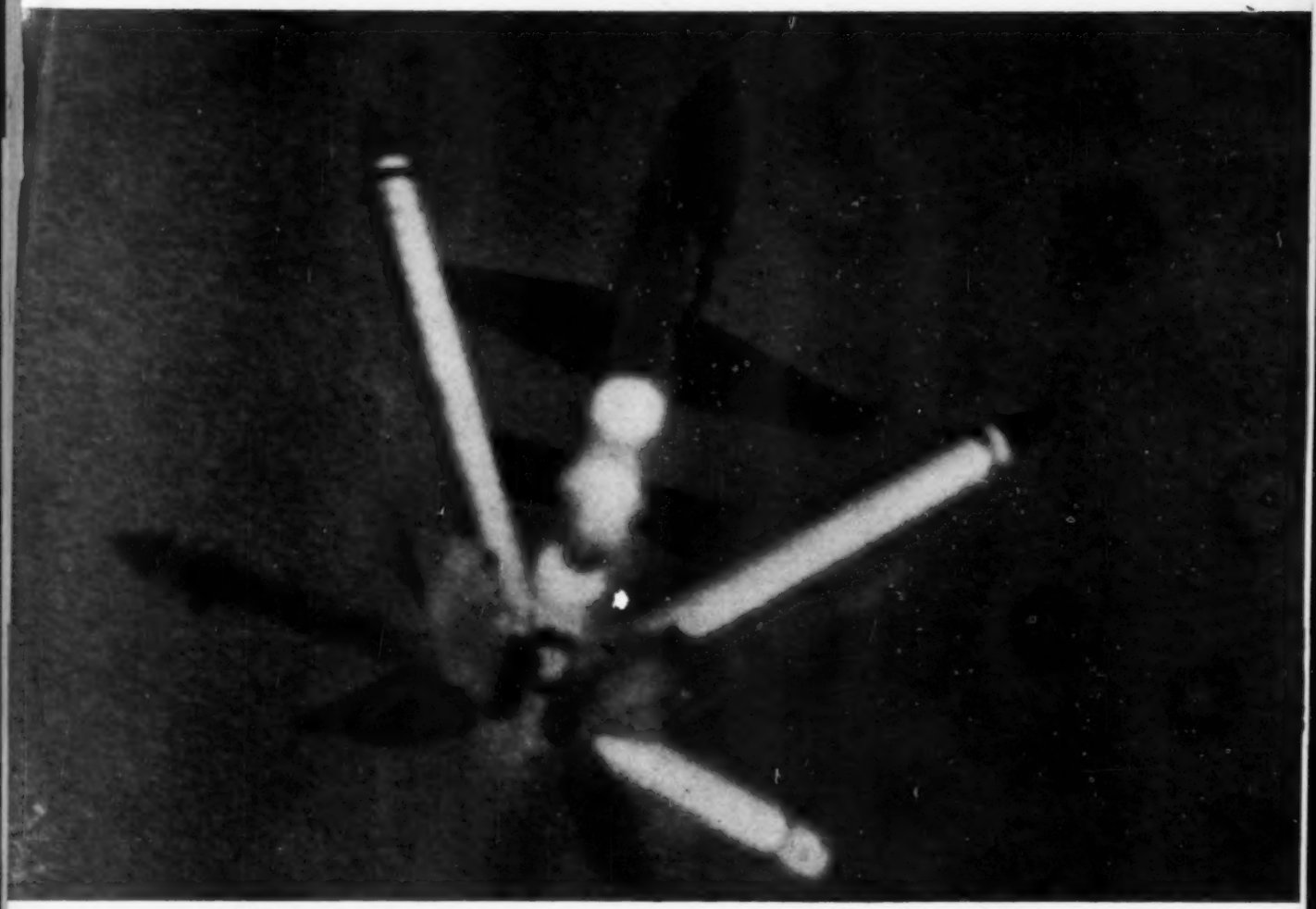
DOWTY

LIQUID SPRING

UNDERCARRIAGES

DOWTY EQUIPMENT LIMITED · CHELTENHAM

Member of the DOWTY Group



After booster rockets separate off, the Bloodhound missile pursues its course under the power of its Thor-type ramjets

BRISTOL RAMJET ENGINE IN PRODUCTION AND READY FOR SERVICE

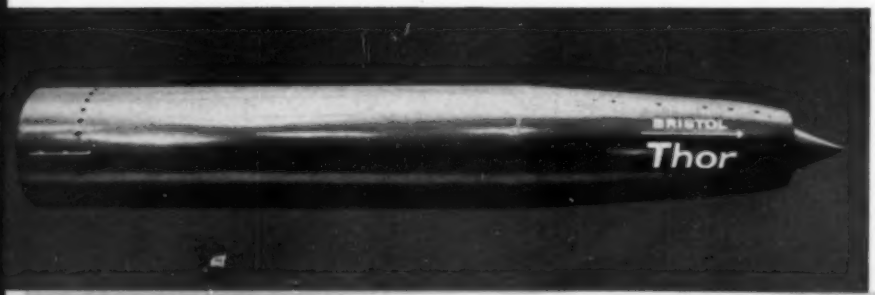
Fully developed and proved, Bristol Thor-type ramjets power the Bristol/Ferranti Bloodhound ground-to-air missile

The Thor achieves complete reliability in starting and in flight–essential in a guided missile. Thor-type ramjets power the Bristol/Ferranti Bloodhound ground-to-air weapon system–chosen as the mainstay of Britain's air defence.

The Thor is a versatile engine–suitable for both manned (mixed power) and unmanned vehicles intended to operate at high Mach numbers within the earth's atmosphere.

Bristol experience with ramjets is the most extensive in the British aircraft industry. This experience continues to expand.

It is backed by the most complete facilities in Britain for ramjet development, including fully equipped laboratories and test cells for simulating supersonic and stratospheric flight conditions.



BRISTOL
Thor

BRISTOL AERO-ENGINES LIMITED